CBCN Canadian Breast Cancer Network

BREAST CANCER AND YOU

A guide for people living with breast cancer

SEVENTH EDITION

ACKNOWLEDGEMENTS

The Canadian Breast Cancer Network (CBCN) works to voice the views and concerns of Canadians with breast cancer. As a patient-directed national organization, we are committed to continuing to promote education, information, advocacy, and knowledge sharing to better meet the needs of patients and families in Canada.

CBCN is governed by a pan-Canadian volunteer board of directors who have all personally experienced a breast cancer diagnosis. The insights, knowledge, and lived experience of our directors guide the work of CBCN and the development of patient resources. Thank you to the dedicated group of volunteers:

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- **Cathy Hemeon** – Newfoundland
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DISCLAIMER

Breast Cancer and You is offered as a general reference tool for healthcare professionals, patients, and caregivers. Patients should consult with a healthcare professional regarding a breast cancer diagnosis and treatment.

This reference is based on information available as of the date of publication, 2022. Future medical advances or product information may affect or change the information provided.

YOUR BREAST CANCER DIAGNOSIS

TYPE OF BREAST CANCER: (pages 18 to 19)

- ☐ Ductal carcinoma in situ (DCIS)
- ☐ Lobular carcinoma in situ (LCIS)
- ☐ Invasive ductal carcinoma
- ☐ Invasive lobular carcinoma
- ☐ Inflammatory breast cancer
- ☐ Other: _____

SUBTYPE: (pages 19 to 21)

- ☐ Luminal A (HR+, HER2-)
- ☐ Luminal B (HR+, HER2 -/+)
- ☐ Triple negative breast cancer (HR-, HER2-)
- ☐ HER2 breast cancer (HR+/-, HER2+)

HORMONE STATUS: (page 19)

- ☐ ER+ PR+
- ☐ ER+ PR-
- ☐ ER- PR+
- ☐ ER- PR-

HER2 STATUS: (page 20)

- ☐ Positive
- ☐ Negative

TNM stage: (page 24)

_____

TUMOUR GRADE: (page 29)

- ☐ 1 (low)
- ☐ 2 (moderate)
- ☐ 3 (high)

OVERALL STAGE: (pages 24 to 25)

☐ **Stage 0:** Pre-invasive breast cancer: _____

Stage I: Early invasive breast cancer

- ☐ Stage IA: _____
- ☐ Stage IB: _____

Stage II: Invasive breast cancer

- ☐ Stage IIA: _____
- ☐ Stage IIB: _____

Stage III: Locally advanced breast cancer

- ☐ Stage IIIA: _____
- ☐ Stage IIIB: _____
- ☐ Stage IIIC: _____

☐ **Stage IV:** Metastatic breast cancer
Locations: _____

ADDITIONAL TESTING: (page 30)

Oncotype DX: _____

MammaPrint: _____

Prosigna: _____

Your Breast Cancer Treatment Plan on reverse of this page

YOUR BREAST CANCER TREATMENT PLAN

SURGERY:

- ☐ Mastectomy (pages 25 to 33)
- ☐ Lumpectomy (page 35)
- ☐ Lymph node removal: (page 22)
  - ☐ Sentinel lymph node biopsy (SLNB)
  - ☐ Axillary lymph node dissection (ALND)

NOTES:

RECONSTRUCTION: (pages 62 to 63)

- ☐ Immediate
- ☐ Delayed

Surgery date: _____

- ☐ Not applicable

- ☐ Breast implants
- ☐ Autologous reconstruction
- ☐ Flap technique:

_____

_____

HORMONAL THERAPY: (pages 39 to 43)

- ☐ Antiestrogen agent
- ☐ Aromatase inhibitor (AI)
- ☐ Luteinizing hormone-releasing hormone agonist (LHRH)

Drug name: _____

Treatment regimen:

_____

_____

_____

TARGETED THERAPY: (pages 54 to 56)

- ☐ HR+
- ☐ HER2+
- ☐ BRCA 1 or 2

Drug name: _____

Treatment regimen:

_____

_____

_____

RADIATION THERAPY: (pages 37 to 39)

- ☐ External beam
- ☐ Internal beam (brachytherapy)

IMMUNOTHERAPY: (page 57)

Drug name:

_____

_____

Treatment regimen:

_____

_____

_____

CHEMOTHERAPY REGIMEN: (pages 44 to 47)

Regimen name:

_____

_____

Treatment regimen:

_____

_____

_____

SUPPORTIVE THERAPIES: (pages 59 to 61)

_____

_____

_____

_____

_____

_____

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INTRODUCTION

HOW TO USE THIS GUIDE

If you have just been diagnosed with breast cancer, you are probably encountering a rush of emotions and questions: Why has this happened to me? What treatments are recommended? What is my prognosis? Can I be cured? What will my life be like from now on?

It is reassuring to know, **most people with early breast cancer are cured**, if the cancer is treated in its early stages.[1,2] This is because breast cancers are increasingly being diagnosed at an early stage, and treatments to reduce the risk of recurrence have improved. **For patients with advanced breast cancers, many are living with cancer for many years** and newer therapies have been improving and lengthening their lives significantly. In fact, breast cancer is now one of the most treatable of all cancers—and the outlook will likely keep improving as new methods of early diagnosis and treatments are developed.

Coping with breast cancer begins with getting some answers to your questions. The more you understand about your diagnosis, your treatment options, and the results you can expect, the more you will be able to participate in your care, make informed decisions, and start to feel less overwhelmed and comfortable in understanding your diagnosis. During this process, you may feel emotionally challenged, in control, or even lost; this progression will be normal for your unique experience. Keep in mind, **each person diagnosed with breast cancer will have a different personal experience.**

The more you understand about your diagnosis, your treatment options, and the results you can expect, the more you will be able to participate in your care

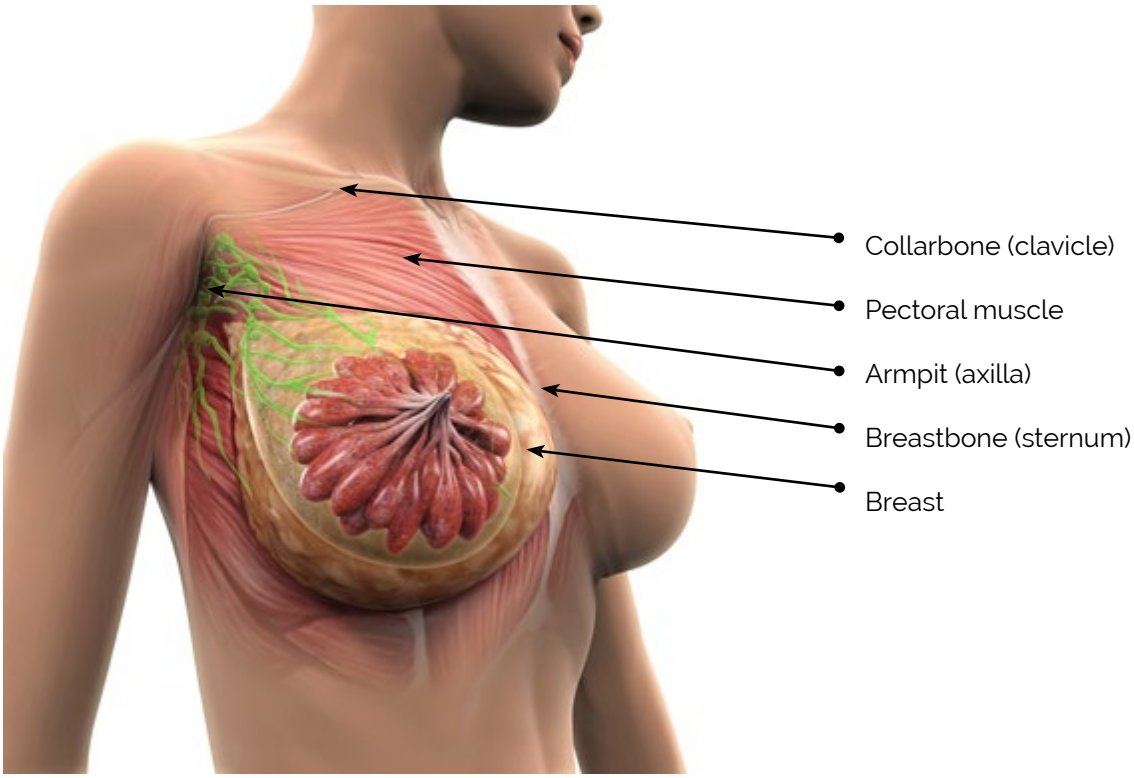
Throughout this journey, you will probably be searching for information to help you in this process. *Breast Cancer and You* was first published several years ago and has been read by thousands of people. The information it contains can be a starting point for discussing your treatment options with your oncologist and healthcare team. This latest edition of *Breast Cancer and You* is aimed to work as a handbook that can be used by you and your health team as a personal resource. It includes useful information on breast cancer staging, diagnostic tests, recommended treatments for each cancer stage, possible side effects of treatment and their management, breast reconstruction options, and more.

We sincerely hope that you will benefit from this handbook to give you a positive lived experience as you progress through this new diagnosis.

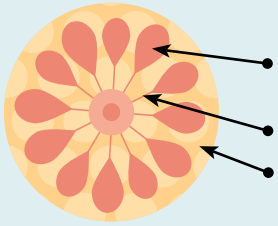
THE NORMAL BREAST

Women and men both have breast tissue, but breast tissue is greater in women compared to men. In women, the breast tissue covers a large area that reaches just under the collarbone, into the armpit (axilla) and inward toward the breastbone. Underneath the breast tissue is the pectoral (chest) muscle. (See Figure 1.)

Figure 1. The breast and surrounding structures



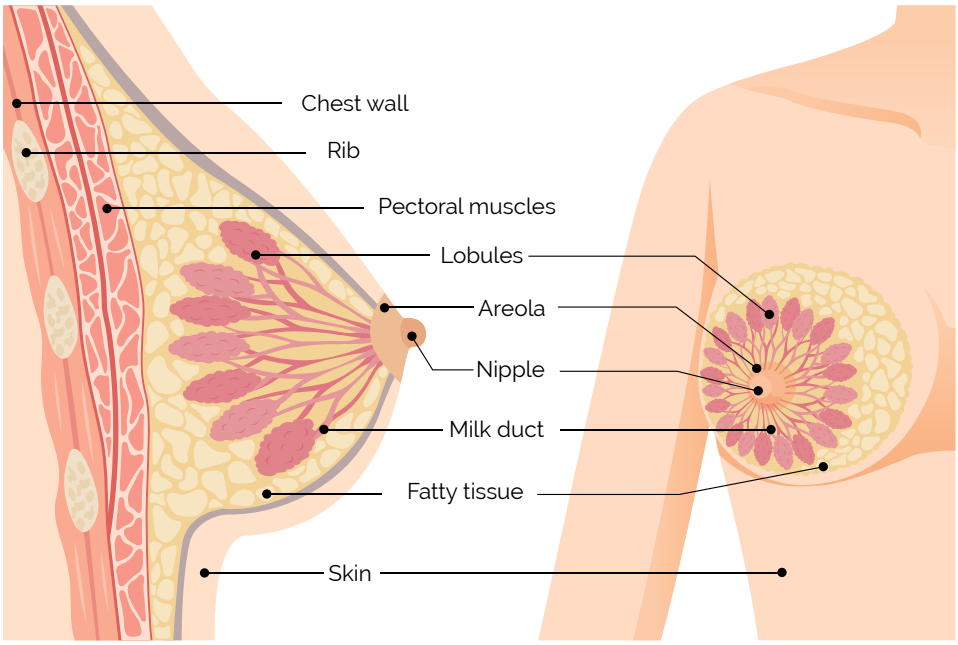
The breasts are classified as accessory organs of the female reproductive system. The female breast contains mammary glands. Only the mammary glands in females can produce milk to feed a baby. This is the basic function of the breasts. Breast tissue is made of:



- Lobules (the glands that produce the milk)
- Ducts (tubes that carry the milk from the lobules to the nipples)
- Cushioning fatty and fibrous tissues such as ligaments (See Figure 2)

The milk exits via the nipple, which is centered in an area of darker skin called the areola. In younger women, the breast tissue is denser, and the number of lobules is higher; in older women, the breast tissue is generally less dense and there is a higher amount of fatty tissue.

Figure 2. Normal breast



HORMONES

Estrogen and progesterone are two female hormones that play a role in breast development and reproduction. Among premenopausal women, estrogen and progesterone are hormones that are mainly produced by the ovaries. After menopause, these hormones are still produced in fat cells, muscle cells, and the adrenal glands, but at lower levels. The adrenal gland produces androgens (male hormones) which get converted to estrogen in peripheral tissues (e.g., fat cells, muscle cells, breast tissue) and is the main methods of female hormone production in post-menopausal women. **These hormones influence the activity of cells in breast tissue throughout most of a woman's life**—from puberty to menopause and beyond.

LYMPHATIC SYSTEM

The breast tissue is supplied by blood vessels and lymph vessels. The lymphatic system circulates a clear fluid called lymph throughout the body. The lymph is filtered through lymph nodes (lymph glands). These are small round structures designed to fight infections, filter out bacteria, viruses, and cancer cells. The lymph nodes around the breast are grouped based on their location to the breast and are found on both sides of the body:

- Supraclavicular nodes (above the collarbone)
- Infraclavicular nodes (below the collarbone)
- Internal mammary nodes (inside the chest near the breastbone)
- Axillary nodes (near the armpit) (See Figure 3)

The number of lymph nodes in the axilla can vary widely from one person to another. There are three levels of axillary lymph nodes based on the location of the large muscle (pectoralis major).

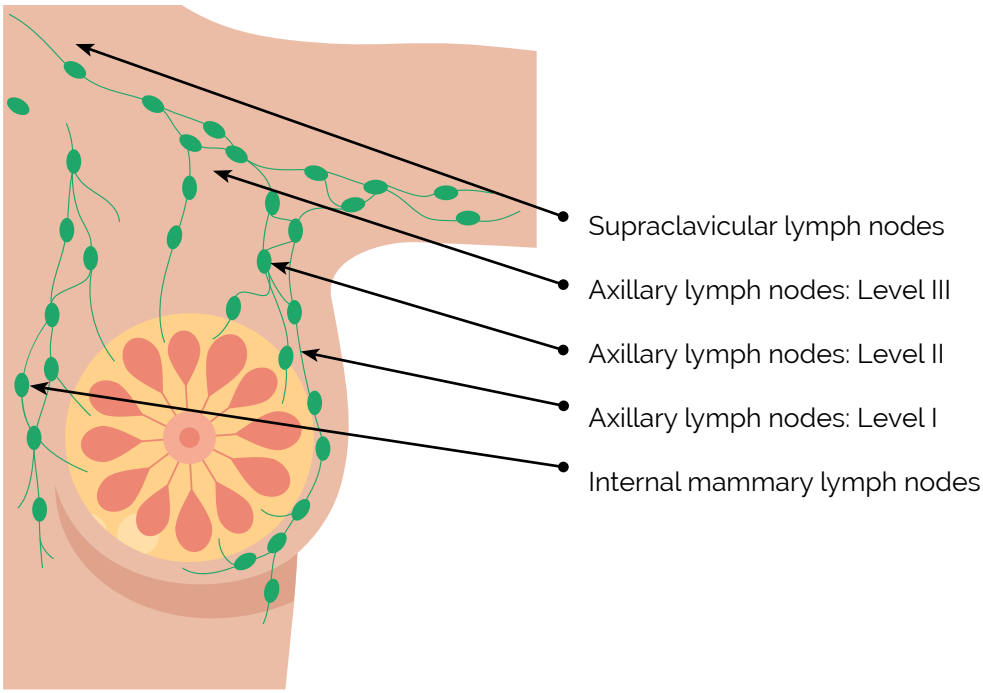
Level I (low axilla) nodes along the outer border of the muscle under the pectoralis major (called the pectoralis minor)

Level II (mid axilla) nodes below the pectoralis minor

Level III (high axilla) nodes along the inner border of the pectoralis minor[3]

As breast cancer usually spreads first into these axillary nodes, this is where doctors will often check for remaining cancer cells after surgery. The spread of breast cancer is more commonly seen in Level I lymph nodes, then at Level II and in Level III nodes. A *sentinel* lymph node is typically the first node that cancer cells will encounter when spreading from the main tumour.[4] (For more on breast cancer staging, see page 17: *Diagnosis and Staging of Breast Cancer.*)

Figure 3. Lymph node groups near the breast



WHAT CAUSES BREAST CANCER?[1]

How cells work

Although many risk factors have been identified, we do not know exactly how they cause normal cells in the breast to transform into cancer cells. However, we do know something about the transformation process itself. Even after you stop growing, many cells in your body continue to multiply (by dividing themselves in two) in order to replace cells damaged by injury or disease, or to replace cells that have died.

Virtually every cell in your body contains DNA, the collection of genes that control the function of the cell. Some genes control when and how often the cell should grow, divide, and die. Some genes, called oncogenes (like the HER2 gene), increase cell division while others, called tumour-suppressor genes, slow down cell division.

When the cell divides in two, its DNA must be copied so that each of the two new cells will have its own copy. Sometimes, **if there is a mistake in this copying**, resulting in a change (called a mutation) in the gene, **the cells behave abnormally, dividing uncontrollably**, and breaking away from the rest of the tissue instead of remaining with it, as would normally happen.

Some mutations are inherited from either one of your parents, like mutations in the tumour-suppressor genes breast cancer 1 and 2 (BRCA1 and BRCA2). However, **most of the time, mutations are acquired over a person's lifetime.** These types of mutations have many possible causes, including certain infections, exposure to radiation or cancer-causing chemicals in cigarette smoke, prolonged exposure to certain hormones, or simply may be random events. Currently, **the nature and number of mutations that may lead to cancer in any given person are still being researched**.

Risk factors

Risk factors are characteristics that increase your chances of developing breast cancer. **Some risk factors are lifestyle-related and potentially modifiable (meaning that you can change them), and others are not**. Some known risk factors for breast cancer are shown in Table 1.

Table 1. Lifestyle-related and nonmodifiable risk factors for breast cancer[5]

Lifestyle-related risk factors	Non-modifiable risk factors
• Smoking[6] • Increased alcohol intake • Obesity • No pregnancy • First pregnancy after age 30 • Hormone replacement therapy (for over 2 years of combined hormones, or over 10 years of estrogen alone) • Some previous fertility therapy hormones • Not having breast fed • High-fat diet[7] • High socio-economic status[8] • Physical inactivity[8] • Exposure to ionizing radiation[8] • Oral contraceptives[8]	• Age • Family history of breast cancer (also in men) • Family history of some other cancers (e.g., uterine, ovarian)[9] • Starting menstruations early (before age 12) • Reaching menopause late (after age 55) • Previous biopsy showing abnormal breast cells • Dense breast tissue • Inherited mutations (e.g., BRCA1, BRCA2)

Race and ethnicity

In Canada, the Ontario administrative healthcare data does not currently include ethnicity in its data collections.[10] However; applicable data from the United States and Europe can be used to understand the parallels seen in the Canadian population.

***Caucasian women and Black and African Canadian women* have the highest rates of breast cancer.**[11] Caucasian women are more likely to develop breast cancer compared to Black and African Canadian women, Hispanic and Asian women.[12] This increase may be due to Caucasian women having children at a later age, the number of children, and the use of hormonal therapy in menopause.[11]

Black and African Canadian women experience poor breast cancer survival rates, are more likely diagnosed with advanced-stage breast cancer, and are diagnosed with aggressive hormone receptor-negative high-grade tumours.[13, 14] They are also more likely to be diagnosed with aggressive triple-negative breast cancer.[11] The age of onset of breast cancer among Black and African Canadian women is at a younger age compared to Caucasian women with risk factors such as reproduction, lifestyle, and tumour biology as possible causes.[11]

***Jewish women from Ashkenazi (Eastern Europe)* also face an increased risk of breast cancer due to inheriting the BRCA1/2 gene mutation**.[15] The Ashkenazi Jewish community has a 1 in 40 risk of being a BRCA1/2 gene mutation carrier, one of the highest risks in any population.[16] The inherited genetic factor in Ashkenazi Jewish women

stems from the founder's effect, whereby a group of founding people were carriers of mutated genes and were geographically and culturally isolated within the same group.[15, 16]

Considering having a higher-than-average risk of developing an inherited gene, genetic testing to screen for mutated BRCA1/2 genes is not a standard of care in this population of women as well as any first degree relative of a carrier who has developed breast cancer.[15] Many Ashkenazi Jewish women discover they are carriers of a mutated BRCA1/2 gene only once they have been diagnosed with breast cancer and this may limit early preventative treatments.[15]

What DOESN'T cause breast cancer: Common concerns addressed[17]

Concerns about breast cancer	What does it mean
Antiperspirants cause breast cancer. 	The main concerns that exist are based on ingredients like aluminum that may be absorbed into the underarm skin and produce estrogen (hormonal) effects. Parabens, used as a preservative, may also produce estrogen (hormonal) activity in the cells of the breast tissue. The concern is that applying these antiperspirants to the close proximity of lymph nodes could cause breast cancer.[18, 19] However, there is no scientific evidence that shows these concerns are linked to breast cancer development. Doctors suggest not wearing antiperspirants during screening mammograms as it may interfere with the images. Breast cancer commonly develops in the upper outer portion of the breast, where there is a lot of breast tissue. It is not due to lymph node location. [18, 19]
If no one in your family has breast cancer, you will not develop it. 	Anyone with breast tissue (including men) can develop breast cancer, whether or not someone else in their family has had it. Breast cancer can be caused by genetic changes, through aging and natural exposures in the environment.[20] The modifiable risk factors mentioned above can influence the risk of breast cancer.
If you are diagnosed with breast cancer, you are likely to die from it. 	Breast cancer is being detected and treated at earlier stages than before. The outlook for people with breast cancer has improved tremendously. In Canada, 1 in 8 women will develop breast cancer at some time during her life, but only 1 in 33 is expected to actually die from the disease. [21]
Only older women get breast cancer. 	The risk of breast cancer increases with age, but young people also develop breast cancer.
Birth control pills cause breast cancer. 	Taking some forms of birth control (which includes estrogen and progesterone) slightly increases the risk for breast cancer, cervical, and liver cancer.[22] The slight increase decreases 10 years after the use of birth control has been stopped.[22]

If breast cancer is in your family, you cannot avoid developing it.

A family history of breast cancer does not automatically mean you will get it too. Furthermore, a number of clinical trials have shown that tamoxifen, a hormonal therapy, or aromatase inhibitors (e.g., exemestane[8]) can help to prevent breast cancer in women who are at a high risk of developing it—for example, because of a strong family history of cancer or a previous biopsy showing abnormal breast cells. Someone at high risk of developing breast cancer should discuss the pros and cons of tamoxifen treatment with her physician.[5]

The risk of breast cancer depends on a combination of circumstances, including if a family member (blood relative) has had breast cancer, lifestyle factors, behaviours, and genetics by the means of genes passed from parents.[23, 24]

The risk of developing breast cancer doubles when a first-degree family member has breast cancer. If there are more than one first-degree family members who have breast cancer, the risk is further increased. [23, 24] A first-degree family member can be a mother, daughter, sister, father, son or brother. [23, 24] A second-degree family member is a grandmother, grandfather, aunt, uncle, niece, or nephew from either the mother's or father's side. [23, 24]

If you have children and breastfeed them, you are protected against breast cancer.

Having pregnancies before age 30 and breastfeeding may lower your risk, but it is certainly not a guarantee of protection against breast cancer.

Breast cancer does not hurt. A tender lump is simply a cyst.

A cancerous tumour is often painless, hard, with uneven edges. Sometimes, however, lumps that are tender, soft, and rounded are also cancerous. Best to check with your doctor.

BREAST CANCER IN MEN

Breast cancer in men is like breast cancer in post-menopausal women. Testing and treatments for breast cancer in men also follow a similar plan of care model with some differences.[25] Male breast cancer can occur at any age but is more common among men aged 60 to 70. Breast cancer in men accounts for less than 1 percent of all breast cancers. **While it is rare for men to develop breast cancer, those who develop breast cancer may be diagnosed at an advanced stage of disease**.[26]

> BREAST CANCER IN MEN IS LIKE BREAST CANCER IN POST-MENOPAUSAL WOMEN.

Types of breast cancer in men

The types of breast cancer men can develop are the same types that women can develop and can include:

- **Infiltrating ductal carcinoma/Invasive ductal carcinoma**: Cancer that starts in the breast ducts and spreads to the duct wall into surrounding breast tissue[27]
- **Ductal carcinoma in situ/intra-ductal carcinoma**: Cancer that originates in the lining of the breast ducts[27]
- **Inflammatory breast cancer**: A rare and aggressive invasive breast cancer with symptoms such as redness and swelling of the breast.[27]
- **Paget disease of the nipple**: Another rare breast cancer that involves the skin of the nipples.[27]

Infiltrating ductal carcinoma/invasive ductal carcinoma is the most common type of breast cancer in men.[27]

Risk factors[25]

Recall, a risk factor is any factor that increases the risk of developing an illness.

Risk factors for breast cancer in men can include:

- ☐ Family history
- ☐ BRCA gene mutation
- ☐ Klinefelter syndrome (a rare genetic disorder that involves low androgen levels and high estrogen levels)
- ☐ Radiation exposure
- ☐ Cirrhosis (liver disease where scar tissue is present in the liver; due to the scarring, the liver function decreases causing high estrogen levels and low androgen levels).

What does breast cancer look like in men? [25, 26, 27]

Some signs and symptoms of breast cancer in men may include:

- ☐ Fluid discharge or bleeding from the nipple
- ☐ A red, scaly, or crusting of the nipple
- ☐ Pain, swelling, or a lump on the breast or nipple
- ☐ Inverted nipple (nipple turns inward)
- ☐ Change in breast size or shape
- ☐ Skin of the breast changes in texture resembling an orange peel (called peau d'orange)

Men are encouraged to maintain breast self-awareness (BSA) of their breasts to become familiarized to their breast anatomy. This will allow you to notice any signs of changes in your breasts. It is important to report to your physician any small changes you may have noticed.

Testing (biomarkers, staging, grading) and treatments for breast cancer in men are similar to those for breast cancer in women. Breast cancer in men is commonly diagnosed at a later stage (e.g., node positive breast cancer) as many of the signs and symptoms are not noticed.

NOTES

Many people who experience breast cancer lead long and healthy lives. This is because their tumour is detected and treated at an early stage, when there is a greater chance of treatment success. The purpose of screening tests is to look for signs of disease in people who do not have symptoms, so that any cancer can be found and treated early.[5] The screening method to start with is mammography.

You might have loved ones who may be reluctant to obtain a mammogram for a variety of reasons. Perhaps they are worried about the procedure or the possible result, do not know where to obtain the test, or do not think they are at much risk of developing breast cancer. It is also possible they are avoiding a mammogram because of fears it might be too painful. (In such a case, they can take acetaminophen or an anti-inflammatory drug before the procedure, to reduce the risk of tenderness.)

Every province and territory in Canada has a breast-screening program that can provide useful information about mammograms and let you know whether getting a mammogram is recommended for you. It is important for you to know that there are caring professionals who can help you through the process, and that they will be there for you along the way.

Recommendations and provincial coverage for breast cancer screening[28]

Age	Recommendations and provincial coverage
Under 40	Between 20 and 39 years of age, consult your doctor if you have a first-degree family member with breast cancer or if certain signs or symptoms occur, such as a breast lump or nipple discharge.[5]
40 to 49	**Ask your doctor about:** • Your personal risk of breast cancer • Family or personal history of breast cancer, which will help determine when to start and how often to get screened.[28] • The benefits and risks of mammography Each province has different requirements to make a screening appointment without a referral; you may need to be referred in some provinces. If there are no symptoms and you do not fall under high risk, you may not be screened through the provincial program in some provinces. In other provinces, women under age 49 without symptoms can participate within the provincial breast cancer screening program. You will need to consult with your doctor for a screening mammogram in this population.
50 to 74	Have a mammogram every 2 years (or every year if there are significant risk factors) Province wide screening programs are available with an average risk of breast cancer. A doctor's referral is not required to make a screening appointment in this population.
75 or older	Ask your doctor about what sort of screening would be right for you.
If your personal risk of breast cancer is above average for any reason *(For more about risk factors for breast cancer, see page 5: What causes breast cancer.)*	Make sure you talk to your doctor about what sort of screening would be right for you. For example: • Starting regular mammograms at a younger age • Having mammograms more often • Having additional tests such as breast MRI • Getting a referral to a high-risk or familial clinic for follow-up and/or genetic counselling and testing

For further information, contact your provincial or local breast-screening program. Check online, call the Canadian Cancer Society's toll-free information service at 1-888-939-3333, talk to your doctor, or visit a local health clinic.

Clinical breast examination (CBE)[29]

The CBE can be performed either routinely as a part of a physical exam or if you have described a change or lump in your breasts to your health professional.[30] The CBE is a physical examination. A trained health professional will carefully examine the skin over your breasts and armpits and will systematically check both breasts and armpits to feel any irregularities or lumps. The health professional will determine if this examination is required based on your risk for breast cancer.[30] You should feel free to ask that a female staff person be present in the room if that would make you more comfortable.

Breast self-examination and breast self-awareness

The clinical breast examination is not the same as breast self-examination (BSE) which has moved towards breast self-awareness (BSA). The BSA places greater focus on regular observations of breast tissue to notice abnormal changes.[31]

BSA is a way for people to observe how their breasts look and feel**. Knowing your breasts will make it easier to notice changes** in your breast over the long-term and to report these to your health professional when they occur.[31] BSAs can be performed after a shower or while getting dressed, if you choose to do them. Breast self-awareness can be done once a month after your period. In the past few years, research on BSE has shown that a particular self-examination routine is not required, unless risk factors are present, placing more emphasis on regular observation.[30,31] However, some healthcare teams are still advising their patients to continue. If you are uncertain about the proper techniques for BSA, ask your health professional.

Mammography[32]

A mammogram is a specialized X-ray of the breasts whose purpose is to find changes, such as very small lumps or calcifications that cannot be felt by hand, that might be signs of early cancer or a precancerous state. Mammograms are safe—the dose of X-rays that you receive is very small. The benefits of mammography outweigh the risks for women aged 50 to 69. If you're under age 50 or over age 74, talk to your doctor about the benefits and risks of mammography, and whether you'd benefit from it.

A mammogram is a screening tool used to detect early signs of breast cancer and to help determine if further testing is required. Health professionals will decide between two types of mammography.

1. **Screening mammography:** used to screen for breast cancer in women who do not show any symptoms of breast cancer. It is used to monitor changes in the breast tissue over time and assist in finding cancer in the early stages.[33, 34]

2. **Diagnostic mammography:** used when breast cancer symptoms are present and if a change is seen on a screening mammography, or during a clinical breast exam or during breast self-assessment. **Diagnostic mammography creates detailed images of the targeted area in the breast and at different angles**.[33, 34]

A new screening tool called digital tomosynthesis is being used routinely in some areas. Tomosynthesis is a form of X-ray that takes 3D images of the breast.[35] It is different than a mammogram as it gives a 3-dimensional image while a mammogram only shows a flat 2-dimensional image.

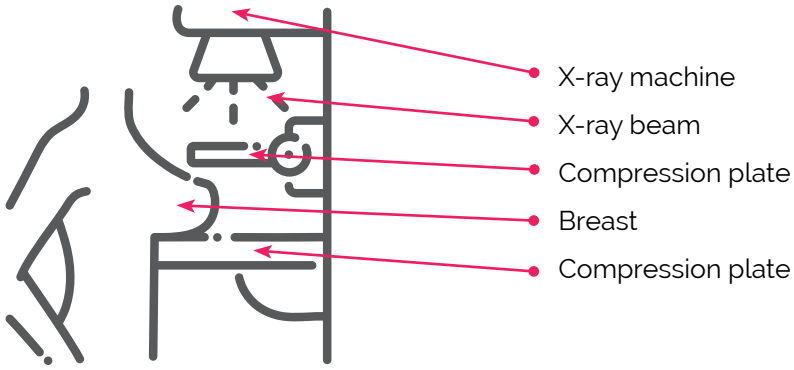
If you have a lump or another problem such as an abnormal discharge from the nipple, or if you have already been diagnosed with breast cancer, you will need tests that are designed for diagnosis of problems rather than for screening. If you have already had cancer, mammograms, and possibly other tests (e.g., ultrasound or magnetic resonance imaging [MRI]) may be recommended on a regular basis to screen for other cancers or return of a previous cancer.[33]

How it's done[5]

You should have your mammogram done at an accredited mammography centre to ensure that your mammogram is done to high standards. The Canadian Association of Radiologists keeps an up-to-date list of accredited centres.

You will be asked to stand near the mammography machine and the technician will place your breast between two plastic plates, which are then pressed together, flattening the breast to make as much of the breast tissue clearly visible as possible (see Figure 4). The compression may not be very comfortable, but it will only last a few seconds. The technician will take front and side views of each breast, and then make sure the films are of good quality.

Figure 4. Mammography



How to prepare for a mammogram:[33, 36]

- On the day of your mammogram, do not apply deodorant, body lotion, or talcum powder under your arms or on your breasts as these products might reduce the accuracy of the test. Some deodorants/lotions contain minerals and metallic substances, which can resemble dense particles or calcification on the images.
- Wear a top that you can easily remove and do not wear jewelry that might get in the way.
- If your breasts become more tender before your menstrual periods, you might want to avoid scheduling a mammogram in the 7 to 10 days before your menstrual period begins.
- Minimize or avoid caffeinated foods and drinks (tea, coffee, chocolate and cola) 5 to 7 days prior to mammography
- Mild pain may be associated with a mammography; speak to your healthcare professional about taking a pain reliever 1 hour prior to your mammogram.

After your mammogram[37]

There is no such thing as a perfect screening test. With mammography, some breast cancers may not show up (false negatives), or alternatively, an abnormality may be found that looks like breast cancer but is actually not (false positives). If your mammogram shows an abnormality or a change, your doctor may want to do additional tests, including a repeat mammography with detailed emphasis on the abnormal area, a breast ultrasound, and/or a biopsy.

Breast implants

Breast implants should not prevent you from getting regular mammograms. If you have breast implants, you may need a modified technique in which the technician moves the implants out of the way so that the mammogram may show as much of the breast tissue as possible. The mammogram may not produce clear images due to the implant contents (silicon or saline). This makes it difficult to view parts of the breast tissue on the image. Extra images may be taken during the mammogram to ensure clarity of the image. The implants may be pushed back to adjust for breast tissue imaging. It is rare for a mammogram to rupture or damage breast implants.[33]

DENSE BREAST TISSUE

Your healthcare professional may have told you that you have dense breasts after your mammogram. Dense breasts are only seen on mammograms and can make the images difficult to read. **Research has indicated that people with 75 percent or more dense breast tissue are 4 to 6 times more likely to develop breast cancer.**[38]

You may recall, breasts are composed of different tissues: glandular tissue, fatty and fibrous tissue. The composition of each of these tissues varies in the breasts for both women and men. Glandular tissue and fibrous tissue are more dense than fatty tissue. Therefore, dense breast means there is tissue that is more glandular and fibrous tissue compared to fatty tissue.

"I rarely did self-exams because I didn't know what I was looking for - my breasts had lumps all over the place. After I was diagnosed, and I felt my cancerous lump– immediately I could feel the difference – the lump was hard and felt like a muscle. I finally understood – know your breasts so that you know when a lump is different, and it was!"

– Carmela B

Some factors, which affect breast density, can include: [38, 39]

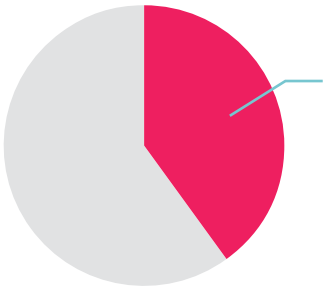
- **Age:** Having dense breast is common in younger women. For some women, breast density decreases as women get older
- **Menopause:** A decrease in breast density for most women
- **Ethnicity:** Asian women may have increased breast density
- **Heredity:** Breast density is an inherited trait
- **Hormone Replacement Therapy (HRT):** Women on HRT have increased breast density
- **Breast size:** Breast density is higher in smaller breast size
- **Pregnancy/breastfeeding:** Breast density increases during this time
- **Weight:** Increased body mass index is not related to breast density
- **Aromatase inhibitors/Tamoxifen:** Some cancer treatments decrease breast density

Breast density classification[39]

After your mammogram has shown dense breasts, your healthcare professional will classify breast density from 4 classifications. Each province uses a slight variation of the classifications (as either a percentage, letter, or description). Many Canadian centres will use the American College of Radiologist Breast Imaging Reporting and Data System known as BI-RADS. BI-RADS is used to categorize increasing breast density from A to D. Each of the 4 classifications describe the amount of dense tissue or fatty tissue in the breasts.

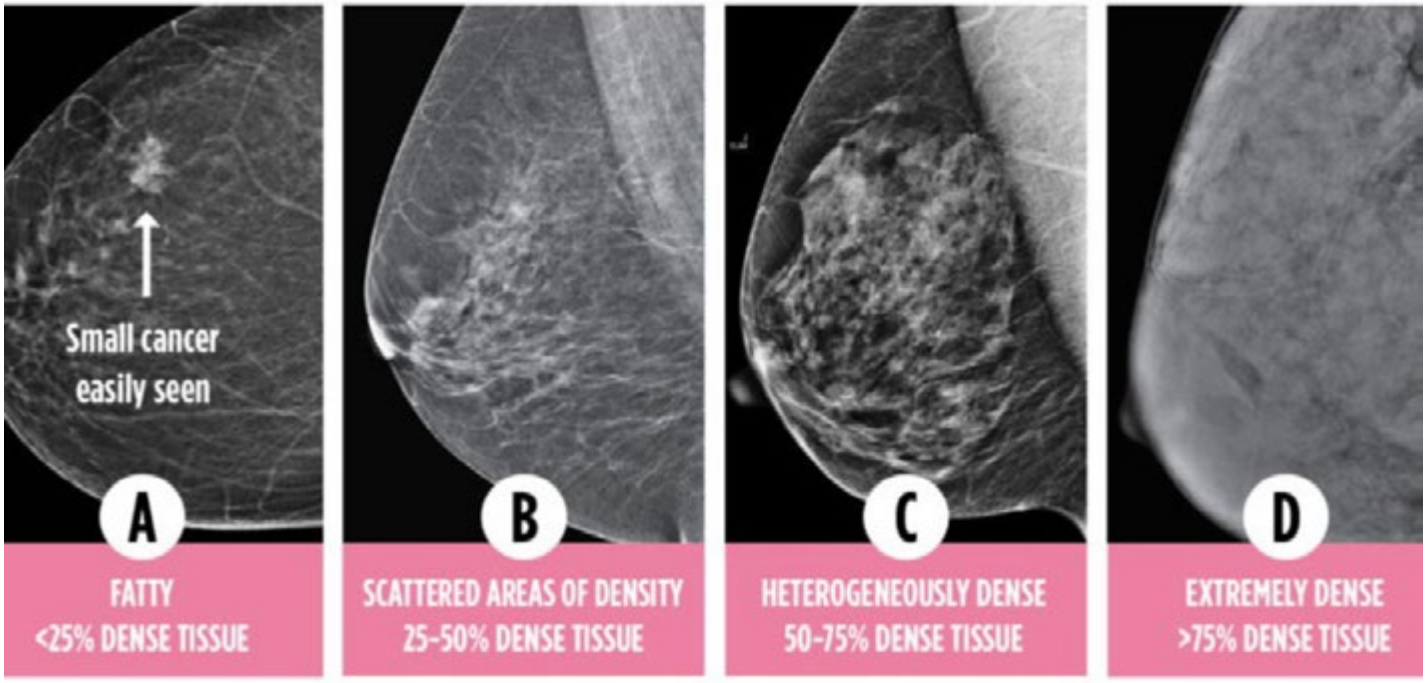
The 4 classifications include:[39]

- **BI-RADS A:** Mostly fatty tissue
- **BI-RADS B:** Few areas of dense fibrous and glandular tissue
- **BI-RADS C:** Equal amount of dense tissue and fatty tissue
- **BI-RADS D:** Entire breasts contain dense tissue



About 40%
of women are in the BI-RADS C and D categories.[38]

Figure 5. Breast density classifications by Dense Breasts Canada[40]



Importance of knowing you have dense breasts[38, 39]

When looking at a mammogram, fatty tissue looks dark on the image. Fibrous and glandular tissues look white or opaque. Tumours also look white on a mammogram. **The concern arises due to dense breasts hiding or camouflaging tumours on mammogram images** from being detected and seen by the healthcare professional.[38] Dense tissues may reflect more actively proliferating background breast cells, which could feed into cancer cell development. These factors may cause the risk of breast cancer to increase due to increased breast density. It is important to discuss how often you need to get a mammogram and the risk of breast cancer with your healthcare professional.

For women with dense breasts, your healthcare professional can recommend additional screening measures such as an ultrasound and/or MRI by discussing the risks associated, and the best options for you. It is important to understand that densebreast-info.org has found that not all people who undergo additional screening are found to have breast cancer.

IT IS IMPORTANT TO UNDERSTAND THAT DENSEBREAST-INFO.ORG HAS FOUND THAT NOT ALL PEOPLE WHO UNDERGO ADDITIONAL SCREENING ARE FOUND TO HAVE BREAST CANCER.

BREAST CANCER IN THE LESBIAN, GAY, BISEXUAL, TRANSGENDER AND QUEER (LGBTQ) COMMUNITY

Among the LGBTQ communities, people may be at a higher risk of developing breast cancer. Some reasons may include:

Fear of discrimination: People from the LGBTQ populations will not disclose their sexual orientation due to the fear of not receiving quality healthcare or find it is not relevant to their health.[41]

Negative healthcare provider experience: This limits people from the LGBTQ communities from accessing routine healthcare and delays medical screening tests and early detection measures. The avoidance of early cancer screening tests may lead to a late-stage breast cancer diagnosis.[41]

Minimal-targeted awareness messaging: There is a lack of awareness and educational messaging for the LGBTQ communities. There are very few focused breast cancer awareness campaigns and informational resources for this community.[41]

Screening

Transgender women[42]

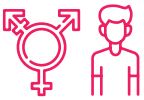
For trans women on the trans-feminine (male to female) spectrum, it is still important to be screened for breast cancer. The aim of screening is to locate breast cancer before you present any symptoms.

A regular mammogram or other screening test is recommended for breast cancer every 2 years if:

- The risk of developing breast cancer has increased because you have taken gender-affirming hormones (such as estrogen) for more than 5 years
- You are between the ages of 50 to 69 and have taken gender-affirming hormones for more than 5 years

A regular mammogram or other screening test is not regularly required for breast cancer if:

- You have taken gender-affirming hormones for less than 5 years
- You have never taken gender-affirming hormones



Transgender men[42]

For trans men on trans-masculine (female to male) spectrum, it is important to be screened for cancer in the chest area.

A regular mammogram or screening test in the chest area is recommended every 2 years if:

- You are a trans man 50 to 69 years old
- You require monitoring of the health of your chest regardless of if you have had top surgery (male chest reconstruction to surgically remove breast tissue)

Lesbian, bisexual, and queer women[42]

Some people in these groups may not associate with or identify with their breasts and make breast screening a priority.

- It is important to get breast screening for women aged 50 or more every 2 years

"I FOUND A LUMP IN MY BREAST…"

The tissues of the breast are influenced by changes in hormones during many stages of a person's life, such as puberty, the menstrual cycle, pregnancy, breastfeeding, and menopause. Most breast lumps arise from these influences and are not cancerous. For instance, many women notice that their breasts develop lumps that disappear and reappear with every menstrual cycle.

- **If you are premenopausal**, see your doctor about any lump that does not disappear completely after your period.
- **If you are postmenopausal**, see your doctor about any new lump or changes in an existing lump.

You may have noticed a change in your breasts during a self-assessment or your doctor may have found a breast lump during a clinical breast examination. If so, you will need additional diagnostic tests to find out whether the lump is cancer—and if it is cancer, to find out its type and stage to help plan the best treatment for you. These additional tests may include a diagnostic mammogram, an ultrasound examination, and/or a biopsy.[43] Sometimes the results of a single test are inconclusive, so several tests may be done to increase the certainty of getting a correct diagnosis. **Often, a biopsy is required to make a definite diagnosis of cancer**.[44]

"The day I found a lump, I reached out to my doctor immediately. The scan showed that the lump turned out to be nothing, but they did detect breast cancer in another part of my breast. Call it divine intervention or pure luck, but that lump saved my life."

– Jackie Greenham

ABOUT BIOPSIES

To biopsy a tumour, **a small sample of tissue from the breast lesion is removed to examine its cells closely under a microscope**. This examination, done by a pathologist, confirms whether cancer is present. The pathologist will report on the type of cells, the characteristics of the cell, and whether the cells are normal, cancerous, or abnormal but non-cancerous. If the report concludes the cells are cancerous, further analysis may be required to determine the type of tumour, the rate of growth of the cancer cells, and if the cancer cells have spread to other surrounding tissues.[45] This information, will help to decide which treatment options are the best for you. (For more on treatment options, see page 31: *An Overview of Treatment for Breast Cancer.*) To better understand your reports, see: mypathologyreport.ca.

Your tumour can be biopsied using different methods such as needle biopsies.
Needle biopsies take a sample of the lump using a needle. There are two main types:

- **Fine needle**: needle aspiration using a fine needle with a syringe to remove a sample of cells, tissue, or fluid from the breast lump. Fine needle biopsy is a minimally invasive method, may require local anesthesia, and will leave no scarring.[45,46]
- **Core needle biopsy:** needle aspiration using a hollow needle with a syringe to extract a cylinder-shaped sample of tissue (a core) from the breast lump. Core needle biopsy requires local anesthesia and will also not leave any scarring.[45, 46] Often, the radiologist will use the guidance of ultrasound or a mammogram to help guide the needle accurately into the lump.[47]

Excisional biopsy: This type of biopsy attempts to remove the entire lump from the breast (the tissue sample is the entire lump), as well as a surrounding area of normal tissue called the margin. Since this method is a removal of the entire lump, local anesthesia, sedation, or general anesthesia is required, which may result in a longer recovery period and may leave a scar.[45, 46]

WHEN THE DIAGNOSIS IS BREAST CANCER: WHAT HAPPENS NEXT?

If the diagnosis of cancer is confirmed, two other very important series of tests need to be carried out. These series involve:

1. Classifying the type and characteristics of the breast cancer you have and;
2. Determining the stage of the cancer (including the size of the tumour and its extent, if any, outside the breast)

The results of all of these tests are essential to help decide which treatment options would be best for you. This section gives you more details about these tests.

"Advice to anyone newly diagnosed: take one day at the time. If you are not able to bring anyone, ask if you can record the appointment (definitely helps if you have to go alone)."

—Katharina Lenz

CLASSIFYING THE CHARACTERISTICS OF YOUR BREAST CANCER

Classification of tumours by invasive, non-invasive, or in situ:[48]

Classified as:

- **Invasive tumour:** Cancer cells have spread into the surrounding tissues of the breast.
- **Non-invasive tumour:** Cancer cells have not spread outside the glands or ducts where the cancer was first detected in the breasts. This is also known as in situ.

Types of breast cancer

The affected cell type in the breasts defines the type of breast cancer.[48] The most common type of breast cancer is adenocarcinoma, meaning that the cancer originates in the glands of the breast.

There are two main types of adenocarcinoma of the breast, depending on where exactly the cancer begins: ductal carcinomas and lobular carcinomas.

Ductal carcinomas begin in the lining of the milk ducts of the breast.

- **Ductal carcinoma in situ (DCIS),** also called intra-ductal carcinoma or non-invasive ductal carcinoma, is a non-invasive breast cancer that originates in the lining of the breast milk ducts and does not spread to surrounding breast tissue. DCIS is the most common non-invasive breast cancer type but is a treatable early-stage cancer. DCIS is commonly detected through a screening mammogram.[48, 49, 50]
- **Invasive ductal carcinoma (IDC),** also called infiltrating ductal carcinoma or ductal adenocarcinoma, originates in the breast ducts and spreads through the duct wall into surrounding breast tissue. IDC is the most common invasive breast cancer type. IDC accounts for 80 percent of all breast cancers. It is also the most common breast cancer affecting men.[48, 49, 50]

Uncommon carcinomas that may be considered subtypes of invasive ductal carcinoma include medullary carcinoma, mucinous (colloid) carcinoma, papillary carcinoma, and tubular carcinoma. All of these subtypes are treated in similar ways to ductal carcinoma and tend to have a somewhat better prognosis.[5]

Lobular carcinomas begin in the lining of the milk glands themselves (which look like small lobes, or lobules).[5]

- **Lobular carcinoma in situ (LCIS),** also called lobular neoplasia (group of abnormal cells), is characterized as a buildup of abnormal cell growth in the lobules that has not spread to surrounding breast tissue but can develop in different lobules in the breasts. LCIS is diagnosed in a biopsy.[48, 50]
- **Invasive lobular carcinoma (ILC),** also known as infiltrating lobular carcinoma, is an invasive breast cancer originating in the lobules of the breast that spreads into surrounding breast tissue. Like other invasive breast cancers, ILC can metastasize to lymph nodes and spread to other regions of the body. ILC can also occur in different lobules in the breast and is likely to occur in both breasts. ILC is also commonly diagnosed through biopsy. Mammograms often underestimate ILC's true size. About 10 percent of all invasive breast cancers are ILCs. [48, 50]

Other types of breast cancer are relatively uncommon. These include inflammatory breast cancer, Paget's disease of the breast/nipple, and a variety of extremely rare cancers.

- **Inflammatory breast cancer (IBC)[48, 51]** is a rare and aggressive presentation of invasive ductal breast cancer that makes up about 1 to 5 percent of all breast cancers. IBC grows and spreads to surrounding lymph nodes and other tissues quickly.

  IBC presents with symptoms of inflammation (redness and warm skin) of the breasts, change of breast colour (red/purple like a bruise) on a third of the breast, dimples (it may look like the peel of an orange—the peau d'orange sign) and pain and swelling of the breast. It may resemble a breast infection (mastitis), but unlike mastitis, it does not respond to treatment with antibiotics.

  These symptoms are caused by a blockage in the lymph nodes by the cancer cells. IBC is more common among Black and African Canadian women and occurs in women age 40 and younger. **IBC is difficult to diagnose because it does not resemble typical breast cancer symptoms**. IBC may not be seen on a mammogram; a biopsy is used to diagnose the underlying cancer.[5] Among the types of breast cancers, IBC has a lower survival rate.
- **Paget's disease of the breast,[48, 51]** also called Paget's disease of the nipple, or mammary Paget disease, is another rare type of breast cancer that involves the skin of the nipples called the areola (darker circle of skin surrounding the nipple). **It is often first noticed not as a breast lump, but as a skin condition of the nipple.** The nipple becomes dry, scaly, crusty, and itchy, somewhat like eczema, but the condition is not cleared up with the usual skin treatments. The nipple may also turn inward or have a discharge. Paget's disease is diagnosed with either ductal carcinoma in situ (DCIS) or invasive breast cancer (IBC) in 80 to 90 percent of the cases.[51] A biopsy used to reveal that the skin condition is actually caused by an underlying breast cancer.[52] Paget's disease is most common among women but can also affect men.
- **Sarcoma and lymphoma of the breast** are extremely rare cancers that begin in the non-glandular tissues of the breast. Their treatment is quite unlike the other types of breast cancer and more like treatment for other sarcomas or lymphomas.[53]

Hormone receptor status (ER/PR status) [5, 9]

Recall that the hormones estrogen and progesterone encourage the growth of normal breast cells by stimulating their estrogen receptors (ERs) and progesterone receptors (PRs). Not all breast cancer cells have ERs and/or PRs on their surfaces, but if they do, they rely primarily on estrogen to survive. Pathologists can test the tumour tissue to determine whether it has estrogen receptors (i.e., whether it is ER+) and progesterone receptors (i.e., whether it is PR+). A tumour may have any combination:

- ER+ PR+
- ER+ PR-
- ER- PR+
- ER- PR-

Women who have passed through menopause are more likely to be hormone receptor positive. However, hormone receptor positive breast cancer can develop at any age. **Among all breast cancer types, 60 to 75 percent have estrogen and/or progesterone receptors**. [54]

Hormone receptor status is conducted for both women and men. If your tumour is hormone receptor positive (ER+ and/or PR+), endocrine based therapy may be an effective strategy for you. **If you have a recurrence of cancer, your hormone receptor status may or may not be the same as that of the original cancer. This would be verified by a biopsy.**

HER2 status[5, 9]

Growth factors are substances that circulate in the blood and can attach to receptors that sit on the surface of a cell, setting off a chain of reactions inside the cell that end up stimulating the cell's growth. Normal cells in the breast have a receptor on their surfaces called human epidermal growth factor receptor 2 (HER2), which acts as a docking station for certain growth factors in the blood. A gene (a section of the DNA) that is called HER2, HER2/neu, or ErbB2 controls the amount of the HER2 receptor on the cell surface. Normal cells contain two copies of this gene.

In about 15 to 20 percent of all breast cancers, the cancer cells contain more than two copies of the HER2 gene, and therefore produce too much of the HER2 receptor protein (they overexpress HER2). Such a tumour is termed a HER2 positive tumour. The effect of this overexpression is that the cell becomes susceptible to uncontrolled growth. The tissue of your tumour will be tested to find out its HER2 status. Newly diagnosed invasive breast cancer patients are tested for the HER2 status. HER2 positive breast cancers progress rapidly compared to other breast cancers but respond well to targeted HER2 protein treatments. [55] HER2 positive breast cancers, however, are candidates to be treated with antibodies directed against the receptor. These antibodies have revolutionized the treatment and outcome of HER2 positive breast cancers.

The HER2 status of a tumour can sometimes change over time, after treatment or on recurrence of breast cancer and when metastases are found.[56]

Sub-type classifications[57]

Breast cancers can be subtyped into categories according to hormone receptor status (ER and PR) and HER2 status. In short, luminal A tumours tend to be less aggressive than luminal B cancers, and both tend to be less aggressive than HER2 positive or triple-negative breast cancers. HER2 positive cancers may require both chemotherapy and trastuzumab (Herceptin®).[58]

Table 2. Breast cancer tumour classifications

Sub-type	Hormone and HER2 status (usual)
Luminal A	ER+ and PR+ HER2- Low proliferation
Luminal B	ER+ and PR low + or PR- HER2+ or high proliferation
Triple-negative	ER- and PR- HER2-
HER2 overexpressing breast cancer	ER+/- and/or PR+/- HER2+

Triple negative breast cancer (TNBC)

Triple negative breast cancer cells do not contain the common receptors for breast cancer (estrogen, progesterone and the HER2 protein).[55] The breast cancer cells test negative for all three. TNBC is typically diagnosed at a later stage; it grows and spreads quicker than other invasive breast cancers, which limits targeted treatment options. About 10 to 15 percent of breast cancers are TNBC and are more common among women 40 years and younger, who come from a Black and African Canadian background or who are BRCA carriers.[59] **Triple-negative cancers are usually treated with chemotherapy**, and research is active in this area.

Luminal A

This breast cancer subtype is usually estrogen receptor positive and progesterone receptor positive and HER2 protein receptor negative and low in proliferation. This subtype develops slower and tends to have a good prognosis. Luminal A breast cancers account for 30 to 40 percent of breast cancers.[60, 61] Luminal A breast cancers often require only the use of endocrine therapy.

Luminal B

This breast cancer subtype is also estrogen receptor positive, progesterone receptor negative (or low positive) and HER2 negative. Luminal B breast cancers develop faster than luminal A breast cancer and have a poorer prognosis. This is due to higher tumour grade, tumour size and lymph node positive association.[60] Luminal B breast cancer has a higher proliferation index (determines how fast breast cancer cells divide) compared to luminal A breast cancer. Some Luminal B cancers may involve the use of chemotherapy as well as endocrine therapy.[61]

DETERMINING THE STAGE OF YOUR BREAST CANCER

Why it is important[5]

Determining the stage of your breast cancer (based on its size and extent) is essential because different stages of breast cancer have different risks of recurrence and may require different treatment modalities. **It estimates "how much" cancer was found**. The stage of your cancer is a key factor in helping to decide which treatment options are best for you, help predict the prognosis, predict treatment effectiveness, and help identify potential subjects in clinical trials for new therapies. The staging is determined according to a staging system commonly used in cancer care.

How it is done

In order to stage your cancer, you may undergo a number of tests and procedures, described below. Not all people will need all of these staging tests.

Recall that breast cancer cells may spread by travelling from the breast to the groups of lymph nodes nearby, particularly in the armpit (axilla). In addition to removing the tumour from the breast itself, lymph nodes in the axilla usually need to be removed so that they can be checked under the microscope for the presence of cancer (see Figure 6). This information helps your healthcare team to stage the cancer accurately, and then to recommend the best treatment options for that stage.[9]

Sentinel lymph node biopsy (SLNB)

A sentinel lymph node is generally the first node(s) that the cancer cell would encounter when spreading from the main tumour. If your cancer is at an early stage and your axillary lymph nodes seem to be clear of cancer on physical examination or ultrasound, your surgeon may carry out a procedure called sentinel lymph node biopsy (SLNB; see Figure 6).[62, 63]

The surgeon injects a small amount of radioactive substance, dye, or both, under the skin of your breast to trace the pathway of the lymphatic system and identify the sentinel node, a process known as mapping. The identified sentinel node(s) is then removed through a small incision and sent to be examined under the microscope by a pathologist. If there is cancer in this tissue, the surgeon may suggest subsequently removing the nearby lymph nodes in the armpit, a process referred to as an axillary lymph node dissection (ALND).

SLNB causes less pain and less difficulty moving the arm, and allows more movement, and less risk of swelling in the arm (lymphedema) than axillary node dissection (see next section).[64, 65]

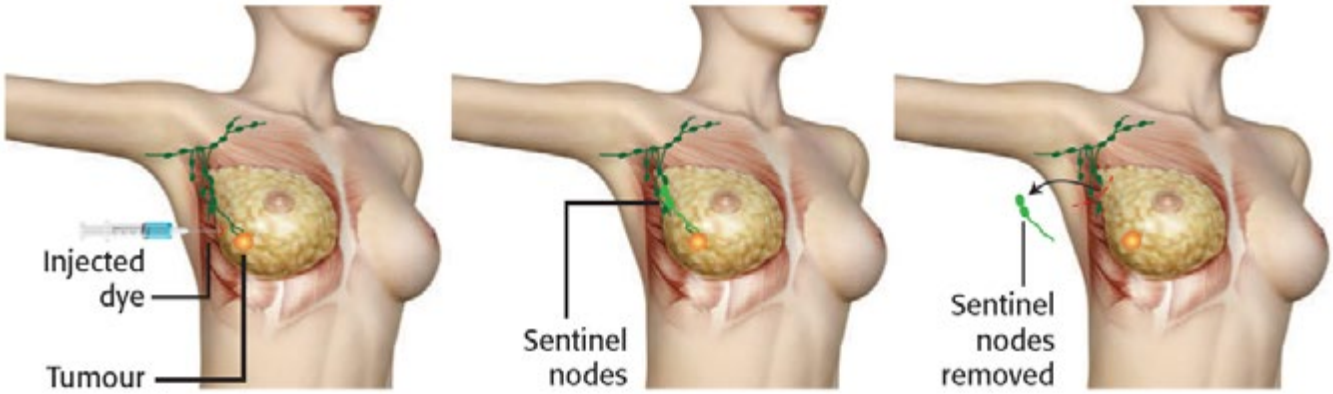
Research has suggested that not all people require an ALND, even if the SLNB shows some tumour cells in a lymph node.[66] Ask your surgeon to explain what she or he would recommend.

SLNB is not recommended if a serious medical condition prevents you from having surgery as a treatment option. SLNB may not be necessary if you have pre-invasive disease (Stage 0) or if your tumour is very small with a very low risk of recurrence (e.g., favorable subtype).

Axillary lymph node dissection (ALND)

In ALND, the surgeon may remove tissue containing up to 40 lymph nodes in the armpit, and send the sample to the pathologist to be examined for the presence of cancer.[67] After the surgery, preventative measures such as a draining tube, antibiotics, pain relievers, and instructions on how to manage the wound will be discussed, along with your level of physical activity, how to position the arm, lymphedema, and how to assess for symptoms/side effects.[68] Further staging investigations may be recommended based on your pathology findings, any abnormal laboratory or clinical findings, or symptoms suggestive of breast cancer that has spread.

Figure 6. Sentinel lymph node biopsy



Bone scans [5]

A bone scan (or bone scintigraphy) is used to check whether the cancer has spread to your bones. Bone scans are also used during preliminary diagnosis to create baseline data and to be used during and after treatments. In this test, a very small amount of radioactive material is injected, and is taken up by the body's bone-making cells. These cells tend to cluster in areas of bone that have been damaged by disease. The location of the radioactivity—and therefore, of diseased areas of bone—can be picked up using a special camera.

Other imaging tests [5]

A chest Xray or computed tomography (CT) scan of the lungs may be done to find out if any cancer has spread to your lungs and to assess the general health of your heart and lungs in preparation for cancer treatment. An ultrasound or CT of the abdomen may also be conducted to determine whether any cancer may have spread to the liver or other abdominal organs.

These staging tests, however, are not necessarily required nor recommended in earlier stages of breast cancer, unless there are symptoms of concern. Be sure to ask your physician for guidance as each individual case is different. In general, for stage I breast cancers, no staging tests are needed.

Staging systems

Staging systems classify breast cancers according to the size of the tumour mass and whether or not it has spread to nearby tissues, to lymph nodes near the breast (armpit or axillary nodes), and to other tissues of the body (e.g., bones, liver, lungs, or brain). One commonly used staging system in Canada is known as the ***TNM system*** because it classifies tumours by:

- Tumour size (T),
- Lymph nodes involved (N), and
- Metastases (spread) (M).

Tumour (T) describes tumour size and if the tumour has grown into surrounding skin or chest wall. The tumour size is described numerically through 0 to 4. The higher the T number, the larger the tumour size.[69, 70]

Lymph node (N) describes if the cancer has spread to the lymph nodes and the number of nodes involved. The cancer spread is described numerically through 0 to 3. The higher the N number, the greater the spread and number of lymph nodes involved.[69, 70]

Metastasis (M) describes if the cancer has spread to the distant organs. The cancer spread is described numerically by 0 or 1, where 0 represents no spread and 1 represents cancer spread.[68, 69]

TNM stages that have similar outlooks are grouped together into clinical stages; these stages range from stage 0 (no invasive cancer) to stage IV (cancer spread beyond the breast and lymph nodes, to other parts of the body).

The TNM codes and stages in this system are shown in Table 3.[43] The way the two systems fit together is shown in Table 4, which contains descriptions of stages 0 to IV. Figure 7 illustrates the physical stages of breast cancer.

Table 3. Breast cancer staging: TMN codes

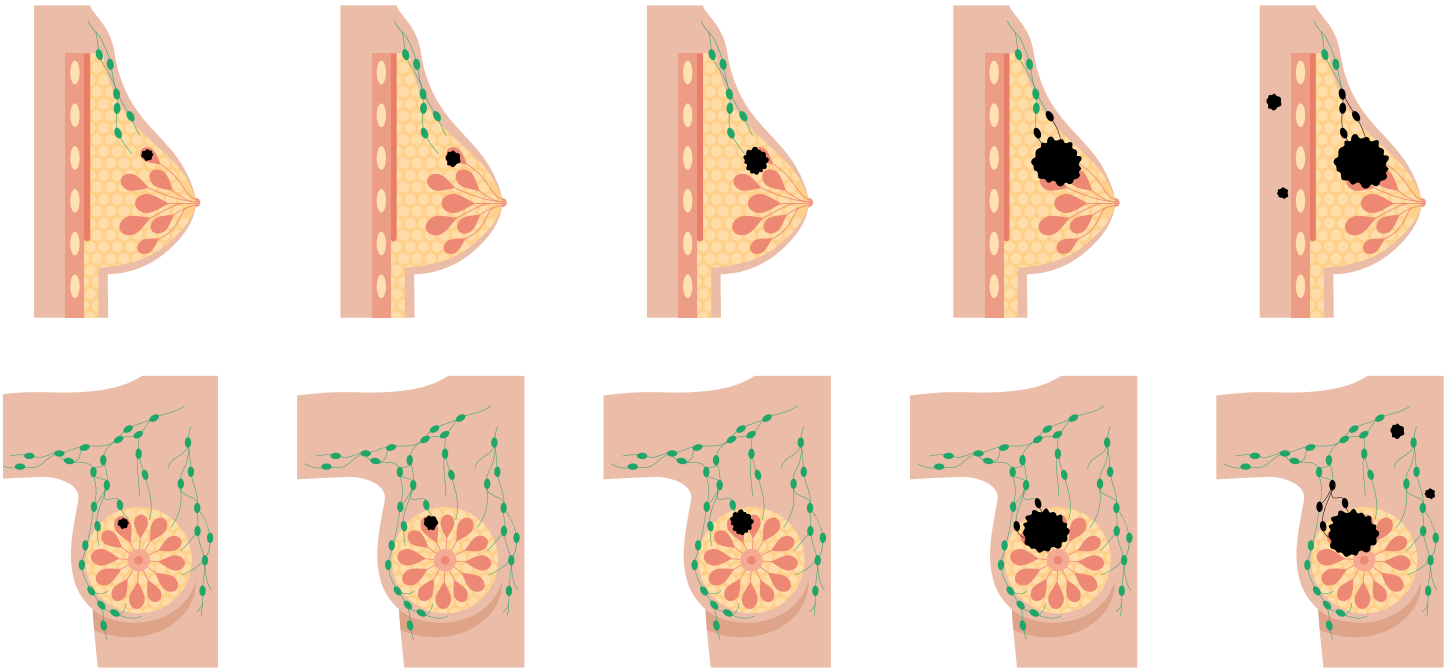
TUMOUR (T)	
Tis	Carcinoma in situ (usually ductal carcinoma in situ [DCIS])
T1	Tumour is 2 cm or less across
T2	Tumour is more than 2 cm and not more than 5 cm across
T3	Tumour is more than 5 cm across
T4	Tumour extends to the chest wall and/or skin (inflammatory carcinoma)
LYMPH NODE (N)	
N0	No cancer in lymph nodes (node-negative cancer)
N0 (i+)	Cancer only in isolated tumour cells within node(s), up to 0.2 mm
N1	Cancer in 1 to 3 axillary lymph nodes on the same side, and/or internal mammary lymph nodes (near the sternum) that were found by biopsy
N1mi	Small clusters of cancer cells (in the range of 0.2 to 2.0 mm)
N2	Cancer in 4 to 9 axillary lymph nodes on the same side, or in internal mammary lymph nodes found by clinical examination or radiological tests
N3	Cancer in at least 10 axillary lymph nodes, in infra-clavicular lymph nodes (found under the collarbone), in internal mammary lymph nodes on the same side plus at least one axillary node, in more than 3 axillary lymph nodes plus internal mammary lymph nodes detected by sentinel node biopsy, or in supraclavicular lymph nodes (found above the collarbone) on the same side
METASTASIS (M)	
M0	No spread to organs away from the breast area
M1	Spread to organs away from the breast area (e.g., bones, liver, lungs, brain)

Note that the newest system adjusts these stages by accounting for other newer biological features of the cancer other than just the size/nodes.

Table 4. Breast cancer staging: Correlation of overall stages and TMN stages[71]

OVERALL STAGE	TNM STAGES INCLUDED	DESCRIPTION
Stage 0	Tis N0 M0	Noninvasive cancer, also known as carcinoma in situ. The cancer cells are within the ducts and lobules, but they have not gone through the walls of the ducts or lobules. Includes ductal carcinoma in situ (DCIS) and lobular carcinoma in situ (LCIS).
Stage IA	T1 N0 M0	The tumour is no more than 2 cm across and has not spread to the axillary nodes.
Stage IB	T0 N1mi M0 T1 N1mi M0	The tumour is no more than 2 cm across, and axillary nodes contain very small clusters of cancer cells (0.2 to 2.0 mm) known as micrometastases.
Stage IIA	T0 N1 M0 T1 N1 M0 T2 N0 M0	The tumour is no more than 2 cm across, and: • Has spread to 1 to 3 axillary lymph nodes OR • Has spread to internal mammary lymph nodes OR • The tumour may be more than 2 cm but no more than 5 cm across and has not spread to lymph nodes.
Stage IIB	T2 N1 M0 T3 N0 M0	The tumour is more than 2 cm but no more than 5 cm across and has spread to 1 to 3 axillary nodes and/or internal mammary lymph nodes. OR The tumour is larger than 5 cm but has not spread to lymph nodes or to the chest wall or skin.
Stage IIIA	T0 N2 M0 T1 N2 M0 T2 N2 M0 T3 N1 M0 T3 N2 M0	The tumour is no more than 5 cm across and has spread to 4 to 9 axillary nodes or has enlarged the internal mammary nodes. OR The tumour is larger than 5 cm across and has spread to 1 to 9 axillary nodes or internal mammary nodes. The tumour has not spread to the chest wall or the skin.
Stage IIIB	T4 N0 M0 T4 N1 M0 T4 N2 M0	The tumour has spread to the chest wall or the skin. It may or may not have spread into lymph nodes but has not spread to organs away from the breast area.
Stage IIIC	T(any) N3 M0	The tumour may be any size. It has spread to 10 or more axillary lymph nodes, lymph nodes under the collarbone, lymph nodes above the collarbone, both axillary lymph nodes and internal mammary lymph nodes, or at least 4 axillary lymph nodes plus enlarged internal mammary lymph nodes.
Stage IV	T (any) N (any) M1	The tumour may be of any size; cancer has spread to organs away from the breast area (e.g., bones, liver, lung, brain).

Figure 7. Stages of breast cancer



NOTES

FACTORS THAT INFLUENCE THE PROGNOSIS OF BREAST CANCER

What do cancer statistics mean?

Before reading about breast cancer statistics, it is important for you to know the following:

- **Statistics can only give you a general picture** because they deal with data from large groups of people. Thus, statistics are only averages, and your situation may differ from the average. Think about a statistic that says the 5-year survival rate for a given disease is 50 percent. That means that half the patients with the disease are expected to live *longer* than 5 years—sometimes, much longer.
- **Overall survival statistics do not take into account that some of the deaths may not have been due to the cancer itself**. For example, if a person with breast cancer were killed in a motor vehicle accident, or died of heart disease, their death would be included in the overall survival statistics, just the same as that of a person who died from breast cancer itself.
- **Statistics like these are always compiled after the fact**—since these have been reported, there may have been new advances in research to improve survival rates. However, the improvement in the general statistics might not show up in the calculations until a few years after the new advances have become standard treatments.

Given these facts, let us look at some breast cancer statistics. Breast cancer is the most common cancer in women in Canada. In all, **1 of every 8 women in Canada will develop breast cancer** sometime during their life, but according to current statistics, only **1 out of 33 will die of breast cancer**.[72] This difference is largely due to earlier diagnosis as well as advances in treatment.

Relative survival refers to a ratio that compares the survival rate of a person with breast cancer to people from the general population without breast cancer. For example, "100 percent 5-year relative survival" means that 100 percent of people with breast cancer are as likely to live 5 years (or more) as the person in the general population without breast cancer. Table 5 shows the 5-year relative survival rates according to breast cancer stage (as the stages were defined at that time).[72]

Statistics for different stages of breast cancer are very limited in Canada. The presented statistics comes from a variety of sources. These statistics may include numbers from other countries that are likely to have similar outcomes as in Canada. These statistics are based on an older version of the TNM staging system that did not include the subcategories A and B for stages 2 and 3.

Table 5. Breast cancer survival

Stage	5-year relative survival
0	100%
I	100%
IIA	93%
IIB	81%
IIIA	72%
IIIB	54%
IV	22%

There are many other ways besides relative survival to look at the prognosis of a disease (meaning the outlook or prospects for patients with that disease). One of these is the chances of cancer-free survival (disease-free survival [DFS]), or to put it another way, the risks that the disease will recur; the lower the risk the disease will recur, the higher the chance of cancer-free survival. Characteristics that influence the risk of your cancer spreading or recurring are known as **prognostic factors**.

Prognostic factors include:[1]

- The size of the tumour (stage)
- Whether or not the cancer cells have spread to the lymph nodes (stage)
- Whether or not cancer cells have spread to the blood vessels or the lymphatic channels (microscopic vascular invasion)
- The grade of the tumour
- The genetic signature of the tumour (see section on multigene assays), useful in some cases
- Hormone receptor (ER and PR) status
- HER2 status

Notice that the first two prognostic factors—tumour size and lymph node association—are also the main factors on which the stage of your cancer is based. (For more details on the stages of breast cancer, see page 17: *Diagnosis and Staging of Breast Cancer*.) Stage is an important prognostic factor—the lower the stage, the better the chances of remaining free from breast cancer recurrence.

Let us look at the chances of cancer-free survival and recurrence rates according to stage of disease.

Stages of breast cancer:

Pre-invasive breast cancer (DCIS, stage 0)

Your chances of remaining breast cancer–free after stage 0 disease are usually excellent since these tumours by definition have not spread outside the breast themselves. However, some people develop DCIS again, or may develop invasive breast cancer in the same, or opposite, breast. The risk depends on the size and tissue type of the DCIS, as well as the type of surgery, and whether tamoxifen treatment was used. (For more information about tamoxifen, see page 48: *Estrogen receptor blockers*.)

Early invasive breast cancer (node-negative, stage I)

If you have stage I breast cancer, your chances of surviving cancer-free are often excellent since the cancer has not yet spread to the lymph nodes and the tumour is small. However, the spectrum of risk is quite wide, depending on your particular risk factors. Due to this range, treatment plans can vary widely between patients.

Invasive breast cancer (lymph-node positive at surgery, stage II)

Stage II breast cancers also vary widely, from a 2 cm tumour with no positive lymph nodes to a 5 cm tumour with up to 3 positive lymph nodes. Hence, the risk of recurrence may also vary widely.

Larger cancers in the breast or in lymph nodes found before surgery (stage III)

Large tumours or tumours with clinically involved axillary lymph nodes may benefit from chemotherapy before surgery (called neoadjuvant chemotherapy). Shrinking the tumour and lymph nodes before surgery may allow the surgeon a better chance of removing all of the cancerous tissue.

Metastatic breast cancer (stage IV)

In stage IV, the cancer has spread to other organs away from the breast, and the focus shifts from cure and lowering the chance of recurrence to goals such as stopping the disease from progressing, controlling the disease for the long term and improving symptoms caused by the disease. Tests will identify the locations of disease, which will be monitored when treatment begins.

Lymphatic or vascular invasion[72]

If cancer cells are found in either lymph channels of the lymphatic system or blood vessels surrounding the primary tumour, the tumour may be more aggressive and more likely to spread or recur (in the breast or elsewhere in the body[73]) than if the lymph channels and blood vessels are clear of cancer cells.

Tumour grade (differentiation)[74]

The grade of a tumour is determined by the appearance of the cancer cells under the microscope. The grade is based on several characteristics of the cells, including the following:

- **Mitotic activity**: Mitosis refers to the division of a cell into two. A tissue sample with high mitotic activity shows many cancer cells in the midst of dividing.
- **Tubule formation**: Normal breast cells form tubules. When cancer cells lose this ability, they tend to be more aggressive.
- **Nuclear pleomorphism** *(variation in the size and shape of the cell nuclei)*: Normal breast cells have uniform-sized and shaped nuclei. As cells become less differentiated, there is more variation in the size and shape of the nuclei.

All these features receive scores, which are added together to obtain the grade of the tumour, ranging from 1 to 3. **Low-grade** (1) cancer cells look similar to normal cells, are better differentiated, grow slower, and are not likely to spread (low risk of recurrence).[75] **High-grade** (3) cancer cells look abnormal, undifferentiated, grow quicker and are likely to spread.[75] Remember that the *grade* of cancer is very different from the stage of cancer.

Age[76, 77]

People who are diagnosed with breast cancer at a younger age, especially those diagnosed before age 35, usually have a greater risk of relapse. Younger women are often diagnosed with advanced breast cancer with more aggressive and high-grade tumours.[75] This increases the risk of recurrence and a poorer prognosis compared to post-menopausal women.[75]

We do not know whether this is because the breast cancer cells in younger women are actually different from those in older women, or simply because younger women have more years ahead of them, leaving more time for the cancer to recur.

Hormone receptor status[1]

Tumours that are hormone receptor positive (ER+ and/or PR+) **tend to be more similar to normal breast tissue** than hormone receptor negative tumours. Hence, tumours that are ER+ and/or PR+ tend to have a good prognosis, are low grade,[75] are often less aggressive and less likely to spread than ER/PR negative tumours. Hormone receptor status is also a predictive factor—tumours that are hormone receptor positive (especially those that are ER+PR+) are likely to respond to hormonal therapies, while ER/PR negative tumours do not.

HER2 status[78]

High levels of HER2 on the surface of the tumour cells (overexpression of HER2) correspond to a greater likelihood that the tumour will recur or spread. HER2 positive is an aggressive breast cancer which used to have a poorer prognosis compared to HER2 negative breast cancers.[75] Nowadays, **given the availability of very effective therapies, HER2 positive cancers often have the best results with treatments**. HER2 status is not only a prognostic factor, but also a predictive factor—a HER2 positive tumour will derive benefit from the addition of HER2 targeted therapies such as trastuzumab, pertuzumab, and others which target the HER2 receptor.

Predicting recurrence with multigene assays[79-83]

Tumors that are hormone receptor positive may also be tested using a multigene assay, which checks whether the RNA in the cancer cells contains a variety of gene products that are known to affect the risk of cancer recurring. The result of this multigene assay is a genetic signature that **can help to predict whether the risk of your particular cancer recurring is high or low**, as well as determine the relative **benefit of chemotherapy** in addition to hormonal therapy. You may need to advocate this to your oncologist to determine whether you are a candidate for multigene testing, whether it may be clinically useful, and whether it is accessible in your area.

There are several types of gene expression tests, which look at specific gene activity: Oncotype DX™, MammaPrint™, EndoPredict™ and Prosigna™, which can help determine treatment options for early-stage breast cancers.

Oncotype DX [84]: A set of 21 genes from cancer cells are assessed to develop a recurrence score from 0 to 100. The score will determine the risk of breast cancer recurrence in 10 years and advantage of chemotherapy after surgery (adjuvant chemotherapy).

A low score (0-17) in ER+ node negative breast cancer indicates a lower risk of recurrence. There is a good outcome with hormone therapy alone and preventive chemotherapy does not help.

An intermediate score (18 to 25) indicates a moderate risk of recurrence. There is a generally good outcome with hormone therapy alone in post-menopausal women and preventive chemotherapy does not help. In pre-menopausal women with a score of 21 to 25, there is a modest benefit to adjuvant chemotherapy.

A high score (26 to 100) is a high risk of recurrence. There is a better outcome with chemotherapy and hormone therapy together. In post-menopausal women, the threshold for recommending adjuvant chemotherapy is unclear.

MammaPrint[84]: A low or high risk of cancer recurrence in 10 years is determined by looking at 70 genes. This test also assesses the lack of benefit of adding chemotherapy as a treatment option.

Prosigna[84] is a 50 gene test used for breast cancers that are stage I or II with no lymph node association or stage II and less than 3 positive lymph nodes. This test is also used in post-menopausal women with hormone receptor-positive and invasive breast cancers to determine the likelihood of recurrence in 10 years.

EndoPredict (EPClin) is a 12 gene test that can categorize early-stage breast cancers into low or high-risk categories. For low-risk tumours, it is felt that chemotherapy may not add significant benefits.

MAKING DECISIONS ABOUT YOUR TREATMENT

At some point during the journey, most people with breast cancer face the challenge of making decisions about their treatment. Everyone has different information needs—some people want to know every detail, while others feel better not being bombarded with information. Everyone has different needs to participate or control the treatment decisions; some people want to decide every issue for themselves, while others feel more comfortable leaving the decisions to the experts on the treatment team. Either way, you are a partner in your treatment. The better you understand the nature of your disease and the rationale of treatment, the more empowered you may feel. **You are the most important part of the team.**

"I made my decisions with the information the oncologist and surgeons gave me, and we reviewed all the options each time. However, for me, the prevailing thought was: 'what do I have to do so I can get as close to 100 percent survival rate and hopefully I will never have to do this again.' I made some difficult decisions, but I did not want to have any regrets or thoughts about 'what if I had done this the first time.' I wanted to throw whatever I could at it the first time… in hopes there will never be second time." Jo-Anna M.

With the feeling of shock and fear when you are first diagnosed, your first impulse may be to start treatment immediately. It is important to understand that breast cancer usually grows more slowly than you might think. By the time a breast lump is large enough to be seen on a mammogram or felt during a breast examination, it may have been growing for a year or longer. This means that in nearly all cases, **you have the time to get accurate information about your options**, find useful resources, get support, ask questions, and gain some perspective before having to decide on a course of treatment.

Before a treatment is chosen, you will need to understand your risks of recurrence, the available treatment options that are suitable for you, and each of their pros and cons, including their possible effects on your future health. (A listing of useful resources is available at the end of this book.) You will be working closely with your healthcare team to establish a treatment plan that will work for you and your diagnosis. **It is important to be comfortable with the treatment approach your healthcare team recommends.** If you are not, it is important to re-evaluate the approach and discuss your concerns with the healthcare team.

"When you are newly diagnosed and begin treatment, take time to pursue interests and enjoy them. Try not to let the cancer diagnosis take over your life." Janet

Determining factors for treatment

With the advances in research, we can tailor your treatment plan to your individual circumstances. Determining which treatment plan is best for you will depend on a number of factors, including:[85]

- The stage of your disease
- The risk of the cancer recurring based on your particular prognostic and predictive factors (such as hormone receptor status and HER2 status and multi-gene assays if performed)
- Your general health and other illnesses you may have
- Your age
- Whether you are premenopausal or postmenopausal
- Your own preferences

The choice of treatment plan may also vary depending on provincial coverage and on your own cancer centre's experience with a given treatment regimen. For example, your cancer centre may offer an opportunity to receive treatment with a new agent as part of a clinical trial.

It is important to understand that because individual situations vary so much, there is no one best treatment for everyone; often there will be more than one reasonable option for you.

TREATMENT MODALITIES

Treatments for breast cancer are commonly divided into two broad groups: local treatments and systemic treatments.

Local treatments focus on the specific area of the tumour and do not affect the rest of the body. Local treatments include surgery and radiation therapy (also called radiotherapy) depending on the type of breast cancer and the stage of breast cancer.[86]

Systemic treatments focus on drugs taken orally or through the bloodstream which respond to cancer cells throughout the body giving a systematic response.[86] Systemic treatments include hormonal therapy, chemotherapy, targeted therapies and biological therapy.[85]

"Acceptance is key; sometimes the only control you have is how you choose to respond. This thought, shared by a friend, meant a great deal to me throughout the years from diagnosis to the present day as I continue to experience health challenges as a result of cancer treatment." Janet

You need to be aware that, **in many cases, more than one treatment modality is used**. (For more details, see page 65: *Treatment of breast cancer by stage.*) Surgery is often (but not always) the first treatment modality to be used. For example, some people receive hormonal therapy or chemotherapy (systemic treatments) before undergoing surgery (a local treatment); other people have surgery (a local treatment) followed by radiation treatment (another local treatment) and hormonal therapy (a systemic treatment). We will take a closer look at each of the available treatment modalities in the upcoming sections.

Treatments for breast cancer can also be classified not only by their modality, but by their purpose and timing.[5, 87] These include:

- ***Neoadjuvant therapy*** is treatment given prior to surgery, which is intended to shrink the tumour before it is removed. In the case of large tumours, neoadjuvant therapy may also provide the surgeon clear margins in the tissue surrounding the tumour, increasing the chances that all cancer cells are removed during the surgical procedure and possibly downstage the type of surgery.

  Nowadays, it is routinely offered for stage II triple negative and HER2+ tumours, for 3 main reasons:

  - Tumour shrinkage before surgery may allow for a better cosmetic result and smaller operation
  - The extent of shrinkage before surgery is informative – dramatic responses predict a very good future prognosis
  - The finding of "leftover" disease at surgery can inform decisions about different medical drug treatments afterwards (adjuvantly) to further reduce the risk of future incurable disease spread (metastases)

- ***Adjuvant therapy*** is treatment given after surgery, to destroy any microscopic cancer cells left behind after the primary therapy, with the hope of reducing the risk that the cancer will recur.
- ***Supportive therapy*** is given to help the body overcome the side effects of breast cancer or its treatment (e.g., anti-nausea therapy, white blood cell stimulating therapy, therapy to prevent osteoporosis).
- ***Palliative therapy*** is given to relieve pain or control symptoms of the disease, usually, but not always, when it is advanced or metastatic (stage IV).

SURGERY

Surgery is not only a key treatment for breast cancer but is also a way to obtain valuable information about your tumour, such as grade and stage. This information will help you and your treatment team decide on the additional treatment options (chemotherapy, hormonal therapy, radiation therapy, etc.) that are most likely to benefit your particular case. (For more information on surgery as a part of staging breast cancer, see page 21: *Determining the stage of your breast cancer.*)

Besides staging, surgery in breast cancer may have a number of different goals:

- Completely removing the cancer
- Removing as much cancer as possible before or after other treatments
- Sometimes, treating local recurrences of cancer
- Lymph node association and removal
- Breast reconstruction

The original surgery for breast cancer, developed approximately 100 years ago, was called a radical mastectomy—a drastic surgery that involved removing the entire breast, skin, muscles in the chest wall, and a large number of lymph nodes in the armpit. Fortunately, we now know that much less drastic options give results that are as good as the radical mastectomy. This type of surgery is no longer performed today and has been replaced by a number of different options that we'll review in this section. These surgical options can be divided into two main types: mastectomy and breast-conserving surgery (Figure 7).

Mastectomy[88]

A mastectomy is one option for you in treating your breast cancer by surgically removing a breast and some surrounding tissues. Mastectomies can consist of a double mastectomy also known as bilateral mastectomy where both breasts are surgically removed. On the other hand, a single mastectomy also known as unilateral mastectomy is where only one breast is surgically removed. Other types of mastectomy can include:[89]

Modified radical mastectomy is a procedure which involves the removal of the full breast (including nipple and areola), most or all level I and II axillary lymph nodes (in the armpit) and tissue which covers the chest muscle but not the muscle. [90, 91]

This procedure is common with invasive breast cancer with lymph node association and inflammatory breast cancer.[90, 91] Compared with the old radical mastectomy, this modified procedure causes less pain, less swelling, and less loss of strength in your arm than the original mastectomy. There is also less risk of lymphedema (swelling in the arm, hand, or chest wall caused by a buildup of lymph fluid). You will usually have an incision over the chest wall and in the armpit.

> *"Choosing to have a double mastectomy was not an easy decision for me to make but my family history helped me to understand my risks and see what other family members experienced. Take your time to choose what is best for you." Jo-Anna M.*

Simple (total) mastectomy is a procedure that involves the removal of the complete breast (nipple, areola, sentinel lymph nodes). [90, 91] The axillary lymph nodes and the chest muscles are not removed.[90] This procedure is common with ductal carcinoma in situ (DCIS) and for breast cancer prevention (prophylactic mastectomies).[91]

Skin-sparing mastectomy a procedure that involves the removal of the breast, nipple, areola and sentinel lymph nodes.90 The breast skin is not removed (spared). This procedure is ideal for people who will consider breast reconstruction and if the cancer is at a very early stage (stage 0).

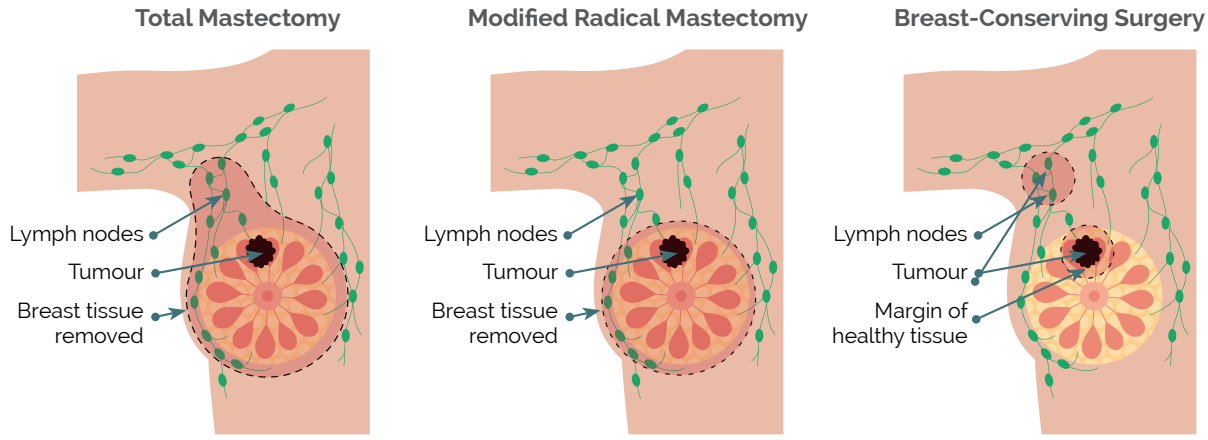
After the mastectomy

A mastectomy usually either involves a short stay in hospital or is performed as a day procedure (you may be discharged on the same day). It is done under general anesthesia. After your surgery, drainage tubes may be left in the area for a few days to allow collected blood and lymphatic fluid to drain from your armpit. The tubes are removed when the drainage slows down. The pain after the operation is managed with standard over the counter pain medication.

After your cancer treatment is finished, you may want to consider a breast replacement called a prosthesis or implant (for more on prosthesis, see page 91 *Appearance and self-image*) or reconstructive surgery (for more on reconstructive surgery, see page 62: *Reconstructive surgery after mastectomy*).

"I remember waking up from the surgery confused but I felt absolutely nothing in my chest. I was expecting to feel a lot of pain. I did not experience any pain with the mastectomy at all – only the drains were uncomfortable. I was surprised how little sensation I had in my chest area- it was numb for quite a while." Jo-Anna M.

Figure 8. Surgical options for breast cancer



Mastectomy in men

A common treatment for breast cancer in men is also a mastectomy.[92] Anatomically men do not have a lot of breast tissue, so some surgeons will remove the whole breast and possible surrounding lymph nodes.[92] Reconstruction surgery is not common amongst men, but some men will decide to have breast skin and nipple reconstruction as a part of the mastectomy surgery.[92]

"The lumpectomy scar when you see it for the first time can be alarming. The fact that a portion was removed from your breast and leaves an indent is not really something I had thought about prior to the surgery. I was glad to have the tumors removed and felt very positive about the surgery at the time. I was told I may need radiation afterwards for a bit; then I would be finished." Jo-Anna M.

Breast-conserving surgery[93]

Starting in the 1970s, many clinical trials were carried out to answer a very important question: if all visible cancer is removed during surgery, instead of removing the entire breast, can some healthy breast tissue safely be left intact? The answer was yes, for most people.[93] There are several types of breast-conserving surgery that allow people to keep (conserve) much of their breast while completely removing the tumour along with a safe margin of surrounding tissue and lymph nodes.

Common types of breast-conserving surgery include:

- **Lumpectomy**: this procedure involves a removal of the lump and a small amount of surrounding normal tissue (surgical margin) with or without lymph nodes
- **Quadrantectomy**: in clinical anatomy the breast is described by four quadrants, this procedure involves removing one quadrant, or quarter, of the breast
- **Segmental or partial mastectomy:** this procedure involves the removal of a piece or segment of the breast

Breast-conserving surgery may be carried out under local or general anesthetic, depending on the extent of the surgery that must be done. It is often coupled with the surgical removal of some lymph nodes under the arm (axillary dissection) or a few lymph nodes (sentinel node procedure) through a second incision under the arm. After most cases of breast-conserving surgery, your health team will recommend radiation therapy.

If I have a choice, should I opt for breast-conserving surgery or mastectomy?[94, 95]

The first thing to know about this important decision is that you do not have to rush into it. You may understandably want to have the cancer removed as quickly as possible, **but it is safe to take a few weeks to think over the options your doctor has recommended**. Breast-conserving surgery is suitable for most people with breast cancer, but mastectomy may be the better option under some circumstances such as:

- If the cancer is relatively large or the breast is relatively small, such that removing only the tumour would leave you with a very small or deformed breast
- If the cancer is in more than one area of the breast
- If you are found to have an inherited genetic predisposition that would make the risk of another future new breast cancer very high (BRCA1, BRCA2, amongst others)
- If the margin of surrounding healthy tissue is not wide enough to be safe
- If you cannot undergo the recommended radiation therapy that would follow breast-conserving surgery because:
  - You have had previous radiation therapy to the same body area
  - You have a condition such as lupus that may prevent you from having radiation therapy (For more details, see page 37: *Radiation therapy (radiotherapy).*
  - You are pregnant
  - Your general health is poor
  - You do not want to have radiation therapy
- If you would feel more comfortable or have more peace of mind with a mastectomy— after having received comprehensive information on all other alternatives

For people in whom breast conservation is an option, it is important to understand that this surgery is just as effective as a modified radical mastectomy (in terms of preventing cancer recurrence in the breast), so long as radiation treatments follow the surgery. Further, it should be noted that some people who have undergone a mastectomy may still require radiation therapy after the procedure, depending on the pathological features of the cancer. **Choosing the option that is right for you can often be difficult**— consult with your healthcare team to address your concerns and questions to ensure that you make the best possible decision for yourself.

If you have breast-conserving surgery followed by radiation therapy, you will need a mastectomy in the rare instance that the cancer recurs in the same breast; you cannot have radiation therapy to the same breast more than once.[96]

Removal of lymph nodes: Sentinel lymph node biopsy (SLNB) and axillary lymph node dissection (ALND)[97, 98]

(For more information about the lymphatic system and lymph nodes in breast cancer, see page 2: *The normal breast*. For more information about ALND and SLNB, see page 22: *Axillary lymph node dissection (ALND) and sentinel lymph node biopsy (SLNB)*. For more information about staging breast cancer, see page 21: *Determining the stage of your breast cancer.*)

In addition to removing the tumour from the breast, lymph nodes in the armpit (axilla) often need to be removed in order to stage your cancer accurately. This removal is not necessary if your risk of recurrence is very low (that is, if you have only Stage 0 disease or a very small tumour with a very low recurrence risk in an older patient population).

A sentinel lymph node biopsy may be carried out if the cancer is at an early stage and if the axillary lymph nodes appear to be clear of cancer (based on findings from physical examination or ultrasound). Recall, with this procedure, a small amount of radioactive substance and/or dye is injected under the skin of the breast to map out the pathway of the lymphatic system and identify the sentinel node(s). The latter is then removed through a small incision and sent for examination by a pathologist.

If cancer is detected, an axillary lymph node dissection may be performed, to remove the nearby lymph nodes in the armpit. This procedure is usually done under general anesthesia, often at the same time the tumour is removed from your breast. A separate incision is made in the armpit, and the surgeon removes a piece of tissue containing some lymph nodes. A small tube is left in the incision for a few days to help drain off fluids and reduce the chance of swelling from fluid buildup.

Research suggests that some people may not need to undergo an axillary lymph node dissection, even if a sentinel lymph node biopsy detects tumour cells in a lymph node.[66] To determine the option that's most appropriate for you, talk to your surgeon and your oncologist(s).

RADIATION THERAPY (RADIOTHERAPY)

How it works

Radiation therapy has been used to treat cancer for at least a century.[99] Radiation therapy is given either as a primary therapy or in combination to a primary therapy (like surgery). Radiation therapy given after a surgery is referred to as adjuvant therapy.[100]

The main type of radiation treatment works by using high-energy rays to damage the DNA (genetic material) of cancer cells in the part of the body that is exposed to the radiation. The radiation also affects normal cells, but usually they can quickly repair the DNA damaged by radiation. However, cancer cells cannot repair their damaged DNA because cancer cells divide more rapidly. They are more sensitive to radiation damage. The desired effect is that the cancer cells will be unable to grow and divide and will die.

To limit damage to normal tissue, the breast is not given more than one series of radiation treatments, even if cancer recurs in the same breast. (Other parts of the body, including the other breast, may receive radiation treatment if radiation is ever needed in the future.)[101]

Your radiation therapy team will also need to know about any medications you are taking, including all prescription and over-the-counter drugs, as well as supplements and natural health products (including herbal supplements). Some of these may affect your radiation therapy by lessening its beneficial effects or worsening its possible side effects; let your team know so they can advise you about what to do.

How radiation therapy is administered[102]

The two common types of radiation therapy used include external beam radiation and internal radiation, also known as brachytherapy.[103]

External beam radiation

Breast cancer is usually treated with external beam radiation, in which machines outside the body direct the beam of radiation onto the surgical site and surrounding tissues. External beam therapy is administered once breast surgery is healed (about 3 to 4 weeks postoperatively if there are no complications such as infections or delayed healing; recent studies have demonstrated the ability to now deliver the radiation in 5 fractions (or 1 week)).[102] Radiation therapy may be administered up to 8 to 12 weeks post-surgery. If adjuvant chemotherapy is required, radiation therapy is given after chemotherapy is completed.[104]

How it is done

You will first have a planning (simulation) session, during which your radiation therapy team will use images or scans to study the area being treated and calculate the exact path of the radiation beams. The team may also place small marks (tattooed in place) on your body to help your body stay in position. These procedures help to make sure that the radiation will be aimed exactly the same way for each of your treatment sessions.

In order to kill as many cancer cells as possible but allow normal cells time to recover as much as possible between doses, the total dose of radiation you receive is divided into daily doses, called fractions. For each session, time is spent helping you get into position on the treatment table and checking and positioning the machines. The actual radiation takes only a few minutes each time and is painless.

It is important for you to know that you will not be radioactive after an external beam of radiation and that it is safe for others to be around you immediately afterward.

Internal radiation (Brachytherapy)

Internal breast cancer radiation involves using a device, which contains radioactive seeds, or pellets that are internally placed into the breast where the cancer was originally growing and removed.[103]

Administering internal radiation is dependent upon the size and location of the cancer and is ideally for people aged 45 years and older with a diagnosis of early-stage invasive breast cancer who have had breast conserving surgery.[105]

Depending on the type of internal radiation, it may take up to one treatment or more in an out-patient radiation clinic, taking precautions for you and the people around you to minimalize radiation exposure. **Some internal radiation types (low dose) may involve a hospital stay throughout the treatment** with safety precautions in place due to active radioactivity.[105]

When is radiation therapy used?

Radiation may be used in several different situations to treat breast cancer. When it is used after surgery, the main goal of radiation therapy is to kill any microscopic tumour cells that may remain.

- **Radiation after breast conserving surgery (BCS):**[104] To remove the risk of breast cancer recurrence, radiation is almost always given after breast conserving surgery. In BCS, external beam radiation is administered to the full breast, skin and muscle in the chest. External beam radiation may also be given on the axillary lymph nodes to decrease the risk of recurrence.
  - A boost of radiation (extra dose) may be administered if there were positive surgery margins (removed tissue surrounding the tumour), if the tumour size is greater than 5 cm, if you were diagnosed with a high-grade cancer, and if you are younger than age 50.[104]
  - Radiation may not be administered if you are age 70 plus, the tumour size is less than 2cm, there is no lymph node association and if the cancer is hormone receptor positive (and you are on adjuvant hormone therapy).[104]
- **Radiation after a mastectomy:**[104] External beam radiation therapy is administered on the location from which the breast was removed, and on the lymph nodes, both axillary (near the armpits) and supraclavicular (near the shoulder).
  - Radiation may be decided after a mastectomy when there is lymph node involvement, a tumour is larger than 5 cm, or when the tumour has spread into the skin or muscles, or if there are concerning tumour factors (multiple tumours, triple negative, HER2+ disease).
  - The times when radiation is not given after a mastectomy is when there is no spread to the lymph nodes, the tumour is less than 5 cm, and there is negative surgical margin (removed tissue surrounding the tumour).
- Radiation may be used before surgery for inflammatory breast cancer, or in cases of very locally advanced breast cancer.[23]
- If you are diagnosed with stage IV (metastatic) breast cancer, radiation therapy may also be used to relieve localized symptoms caused by cancer.
- Radiation may be used as a neoadjuvant therapy (to shrink the tumour) prior to a surgery.[104]
- Radiation may be used as palliative therapy in advanced cancers. Radiation is used as a form of pain therapy or to control symptoms.[104]

Radiation use precautions:

Radiation therapy is not for everyone. For example, if you are pregnant, or you have had previous radiation treatment to the same area of the breast, you may not be a candidate for radiation therapy. Radiation may not be offered to people with severe heart or lung diseases like chronic bronchitis or emphysema; these conditions may be worsened by radiation therapy. Radiation is also not given to people with connective tissue diseases such as systemic lupus or scleroderma, which may cause severe reactions and scarring.[96,106] Your doctor will know whether you have any conditions that would prevent you from having radiation therapy.

Side effects of radiation therapy: What to expect[102]

Side effects are common for many treatments in breast cancer. Your experience can be different from other people. Some people may experience minimal symptoms, and some may experience more. Your symptoms will be dependent on the size of the area under treatment, the dose, and the schedule. Side effects may develop during, after, or weeks after radiation. It is important to remember each experience is very individualistic and you can address your concerns with your health team.

Since the process involves a beam of radiation passing through the skin, you may see skin changes such as:

- Tanning or sunburn-like effect—your skin may redden slightly if the effect is mild, or begin to itch, peel, or blister if the effect is more severe.
- Moist areas in the skin crease under the breast that are more sensitive to these effects. You will want to avoid tight clothing or harsh fabrics like wool; instead use gentle fabrics such as cotton.
- Increased sensitivity to sunlight, so you should protect this skin with clothing—try not to use sunscreens or any skin products that are not approved by the radiation therapy team.

These skin changes usually disappear over a few weeks, but the skin in the treated area may remain slightly darker and continue to be more sensitive to the sun than before.

Other side effects may include:

- Swelling and tenderness, especially in the areas of the nipple, the fold under the breast, and the underarm.
- Lymphedema (swelling of the arm), since radiation to the armpit may affect drainage of lymph fluids. This side effect may last for weeks or months.
- Changes in size, shape, or firmness (your breast may feel slightly firmer than before or develop small blood vessels under the skin.)
- Fatigue. At the end of radiation treatment, some people feel very tired; your energy will return gradually a few weeks after the treatment sessions have ended.

Meanwhile, you might try pinpointing the times when you have the most energy and scheduling your most important activities during those times. Also try to keep your sleep routine regular, using short daytime naps if you need them. Gentle exercise can boost your appetite, help you sleep, and relieve stress.

Radiation treatment for breast cancer does not usually cause nausea; nausea is more likely when a large amount of tissue is treated (e.g., lymph nodes in addition to the breast itself).

HORMONAL THERAPY

(For more information on hormones and hormone receptors in breast cancer, see page 18 : *Classifying the characteristics of your breast cancer.*)

How it works[95]

Hormonal therapy can target cancer cells anywhere in the whole body (systemic) not only in the breast.[107]

Hormonal drug therapy slows the growth and spread of cancer cells either by changing hormone levels in your body or by blocking the effects of the hormones on breast cancer cells. Estrogen is a natural hormone

"The hormone therapy drugs have side effects, and these can range by person. It can put you in immediate menopause, if the chemotherapy drugs did not already, and that means your hot flashes and night sweat can be extreme. I found once I started to exercise and walk every day my side effects became a bit more manageable. I still have the side effects, but they are a bit more tempered and not as extreme as when I first started so I am not sure if it was the exercise or my body regulating itself, but I am able to tolerate the hormone therapies side effects more now." Jo-Anna M.

that can promote the growth of breast cancer cells by interacting with their receptors (ERs and PRs). In cancer cells that have ERs and/or PRs on their surfaces, depriving these cells of estrogen or blocking its effects can shrink tumours.

Estrogen receptor positive breast cancer accounts for about 80 percent of breast cancers and 65 percent are both estrogen receptor positive and progesterone receptor positive breast cancers.[108] If you're one of those people who are hormone receptor positive (ER+ and/or PR+), hormone therapy may be a good strategy.

When is hormonal therapy used?[109]

If your tumour is hormone receptor positive (ER+ and/or PR+), hormonal therapy may be used in a number of different ways. It may be used after surgery, radiation therapy, or chemotherapy to reduce the risk of cancer recurrence. More specifically, hormonal therapy may be used to:[110]

Decrease the risk of non-invasive cancer, DCIS or LCIS, from recurring as invasive cancer as a form of palliative care

- As a form of adjuvant therapy to decrease the recurrence of invasive breast cancer in addition to a new breast cancer from occurring in the opposite breast (contra-lateral breast)
- As a form of neoadjuvant therapy to decrease the size of a tumour prior to surgery
- As a treatment option for advanced stage breast cancer or recurring breast cancer and
- As a form of palliative therapy for pain control and symptom control of advanced metastatic breast cancer.

Among people at high risk of developing breast cancer (i.e., those with a strong family history or certain genetic factors, e.g., BRCA2 gene mutation), hormonal therapy may also be used as a preventive measure.[111]

Types of hormonal therapy

Estrogen receptor blockers

▶ ***Selective estrogen receptor modulators (SERMs)***[112-114]

SERMs block estrogen receptors so that the body's estrogen cannot stimulate them. However, as the name implies the blockage is selective—SERMs block the estrogen receptors in breast tissue but may actually stimulate the estrogen receptors in other tissues.

Tamoxifen, a once-daily tablet, is the oldest and best-known hormonal therapy for people with receptor-positive breast cancer. It blocks the effects of estrogen on breast tumours but has an estrogen-like effect on the endometrium (the lining of the uterus), the cardiovascular system, and the bones.

Tamoxifen uses:[107, 110]

- Used to lower the risk of developing breast cancer for high-risk people
- Used up to 5 years after breast conserving surgery for DCIS and hormone receptor positive breast cancer to reduce the risk of recurrence and developing invasive breast cancer and for lowering the risk of new onset of breast cancer in the other breast
- Used to lower the risk of recurrence for hormone receptor positive invasive breast cancer after surgery and for lowering risk of new onset of breast cancer in the other breast
- Used as neoadjuvant therapy (before surgery) and/or as an adjuvant therapy (after surgery) for about 5-10 years
- Used for pre-menopausal women with early-stage breast cancer
- Used as a treatment by slowing/stopping cancer growth or by shrinking tumours for hormone-positive breast cancer patients where cancer has spread to other locations in the body

- Incidentally, tamoxifen also can have beneficial effects:
  - In post-menopausal women, it can minimize bone density loss that occurs with age.[115]
  - It can reduce cholesterol levels and potentially reduces the risk of heart disease

The **side effects** of tamoxifen are usually mild. Hot flashes usually improve with time, but if they are severe, you have several medication options to help make them more tolerable. You may also have vaginal problems such as discharge and itching. Side effects that are more serious are relatively rare.

- With longer use, tamoxifen is linked to a slightly increased risk of developing uterine cancer for women who have gone through menopause. If you take tamoxifen, you should report any unexplained vaginal bleeding to your physician and be referred to a gynecologist for further evaluation.
- There is also an increased risk of developing blood clots in veins or, very rarely, in arteries. Blood clots in veins in the leg (deep vein thrombosis) are reported in about 2 to 5 of every 100 women treated over 5 years—about the same risk as with birth control pills or hormone replacement therapy.[116] Your risk of blood clots can be higher if you:
  - Are overweight
  - Smoke (or used to smoke)
  - Have recently had surgery
  - Have had a similar blood clot before
  - Have a strong family history of blood clots
- If you develop painful swelling in one or both legs, see your doctor immediately.
  - Infrequently, these clots may break off and travel to the lungs, causing pulmonary embolism, or to the brain, causing stroke. The risks of these life-threatening situations are similar to the risks of pulmonary embolism or stroke when on the birth control pill.[116]

> *"When I started my hormone therapy tamoxifen (at age 25) I had a lot of side effects, but my oncologist did not give up in trying to find a solution. After trying 2 brands we finally found one that has minimal side effects for me personally. So do not give up if you struggle with side effects; there are ways to help." Katharina Lenz*

Keep in mind that when tamoxifen is used appropriately, its benefits far outweigh its risks. It is important to address your questions and concerns with your healthcare team to make you feel comfortable in your heath decisions. Tamoxifen, used as adjuvant therapy for 5 years, can decrease by about 40 to 50 percent the risk of recurrence, metastases, or occurrence in the other breast.[117]

▸ *Pure estrogen receptor antagonists*[118]

This type of agent blocks estrogen receptors by binding to them, blocking the action of estrogen on them and breaking the receptors themselves down. Unlike tamoxifen, a pure antagonist does not have any estrogen-like properties in other tissues of the body.

Fulvestrant is an intra-muscular injection given in buttocks (gluteal area). Fulvestrant is used in post-menopausal women to block and damage estrogen receptors by creating an anti-estrogen effect in the body.[107, 110]

Use:[107, 110]

- Used for advanced breast cancer not previously treated by other hormonal therapy
- Used as an alternative when other hormonal therapies (tamoxifen) are not working in advanced breast cancer
- Used to treat metastatic breast cancer in combination with CDK4/6 inhibitors as an initial or alternate hormonal therapy

The most common side effects include reactions at the injection site, fatigue, nausea, hot flushes, and headache.

Aromatase inhibitors (AIs)[119-121]

Before menopause, most of the estrogen in a woman's body comes from her ovaries. After menopause, it is produced solely from converting a group of hormones called androgens ("male hormones" produced in the adrenal glands) into estrogen (in fat, muscle, and breast tissue) by means of the enzyme aromatase. AIs block this enzyme from working, and therefore reduce the amount of estrogen in the body. If you are postmenopausal and your cancer is hormone receptor positive (ER+ and/or PR+), your doctor may recommend an AI for you. Inclusion of an AI has been found to improve the effectiveness of therapy.

AIs may be used in several different ways:[110]

- Tamoxifen for 2 to 3 years, then AI for total of 5 to 10 years
- AI for 2 to 3 years, then tamoxifen for 5 years
- Tamoxifen for 5 years, followed by 5 years of AI
- AI for 5 to 10 years
- If unable to take AI, then tamoxifen for 5 to 10 years
- As adjuvant therapy, initially for a total of 5 years of treatment (the "upfront strategy")
- As extended adjuvant therapy, to follow 5 years of tamoxifen treatment
- In metastatic disease (for as long as they are working well)
- Used as an adjuvant therapy to reduce the risk of recurrences, an AI can be taken on its own or after tamoxifen treatment and shows greater effectiveness compared to taking tamoxifen for 5 years[107]
- Post-menopausal patients with hormone receptor positive early-stage breast cancer are recommended an AI as adjuvant therapy[107]
- An AI is used for post-menopausal patients who have cancer recurrence or if the cancer has spread, for as long as the AI shows a benefit[107]

Side effects: AIs cause fewer hot flashes, and do not increase the risk of blood clots or uterine/ endometrial cancer. However, they can cause aches and pains in muscles or joints, which are sometimes severe enough to warrant changes in treatment.

One of the most important side effects of therapy with an AI is a slightly increased risk of developing osteoporosis, since AIs decrease the supply of estrogen to the bones. Therefore, if you are taking an AI, you need to consult with your health team and inquire about having a bone density test at least every 2 years, and you should also take the recommended daily amounts of calcium and vitamin D. (For more information, see page 60: *Bone health in people with bone metastases.*)

Luteinizing hormone–releasing hormone (LHRH) agonists and ovarian ablation [122, 123]

If you are premenopausal, most of the estrogen in your body comes from your ovaries, whose production of estrogen is controlled by the pituitary gland in the brain, through another hormone called luteinizing hormone (LH). If your tumour is hormone receptor positive, and if your physician feels it is warranted, this natural production of estrogen may need to be stopped. In the past, stopping or impairing the action of the ovaries (ovarian ablation) was carried out by removing the ovaries surgically (oophorectomy) or treating them with radiation, putting the woman permanently into a menopausal state.

LHRH agonists drugs work by slowing down the pituitary gland's signal to the ovaries. These drugs cause you to go into menopause as long as you take the injection, but their effects are reversible, and periods can resume once you stop treatment. Examples include goserelin, leuprolide, and triptorelin.

Their **side effects** are similar to the effects of menopause. However, there are possible increased risks of heart disease and osteoporosis.

Table 6 compares commonly prescribed hormonal therapies.

Table 6. Commonly prescribed hormonal therapies [109]

Therapy	Effect	Who uses it	Examples
Antiestrogen agents	Block estrogen from stimulating the tumour	Premenopausal or postmenopausal women	Tamoxifen - SERM Fulvestrant - SERD (post-menopausal women only)
Ais	Prevent estrogen from being made by non-ovarian tissue	Postmenopausal women	Letrozole Anastrozole Exemestane
LHRH agonists	Prevent estrogen from being made by the ovaries	Premenopausal women	Goserelin Buserelin Leuprolide Triptorelin
Ovarian ablation	Reduces levels of ovarian hormones	Premenopausal women	Surgery Radiation

CHEMOTHERAPY (CHEMO) [124, 125]

Chemotherapy (chemo) is a systemic therapy, which affects the whole body through the bloodstream. Chemotherapy drugs can cause the destruction of cancer cells or slow the growth of cancer cells.[126]

How it works

Cancer cells and most normal cells multiply by repeatedly dividing themselves according to a complex process. There are many chemotherapy drugs used in cancer treatment that interfere in one or more steps in the complex process of cell division. The goal is to stop the cancer cell from dividing, so that it soon dies. Cancer cells divide rapidly, and therefore they are most liable to be killed by chemotherapy.

How chemotherapy is administered

Chemotherapy for breast cancer can consist of a single drug (often in cases of metastatic disease) or a combination of drugs (in the setting of adjuvant treatment). Combining chemotherapy drugs is based on the idea that the most effective way to kill cancer cells is to attack—or target—the many different processes in the cancer cell all at the same time. Since different chemotherapy drugs damage the cancer cell in different ways, combining them should, in theory, increase the chances of treatment success.

Generally, you can receive chemotherapy as an outpatient. Some chemotherapy drugs are given as pills, but the majority are administered intravenously. A single dose of chemotherapy does not kill all the cancer cells, and multiple doses (cycles) are needed.

A *course* of chemotherapy consists of several cycles, which are given every 2 to 4 weeks, depending on the exact regimen—most of the time you would receive 4 to 6 cycles, given every 21 to 28 days, over 3 to 6 months. Chemotherapy can be infused over a short or long period and rest periods are incorporated into this course.

Clinical trial results have defined several standard chemotherapy regimens that specify the drugs used, their doses, and the timing to produce the best outcomes with the fewest side effects. Whenever possible, you should ideally receive the full chemotherapy dose on schedule, to keep the potential for tumour growth between cycles to a minimum, to prevent resistance of cancer cells to the drugs from developing, and to achieve the best possible results. This will be planned with your health team beforehand.

"It was not until the results came back from my lumpectomy that I found out I had a more complicated case than originally thought. You will find there is a bit of 'Hurry up and Wait': you hurry to get it removed but then have to wait to get the results. Then you hurry up to make a plan and wait for other tests to come back. This can be difficult, but you must focus on the next step and try not to get too far ahead of yourself in the treatment process. With chemotherapy I had my first session and found out I was allergic to the chemotherapy drugs, so we had to adjust the plan again and then move forward. One thing at time. You will get through it." Jo-Anna M.

Most people receive the full standard doses, and the side effects they have are generally predictable and manageable; sometimes, the dose has to be lowered or the next cycle postponed to allow your body time to recover from side effects such as low white blood cell counts.

When is chemotherapy used in breast cancer?

(For more details, see page 75: *Treatment of breast cancer by stage.*)

Chemotherapy is used in many situations in breast cancer, including:

- To shrink a large tumour before surgery (neoadjuvant treatment)
- To destroy any possible undetectable remaining cancer cells after surgery (adjuvant treatment) to reduce the chances of recurrence
- To treat locally advanced or recurrent cancer in the breast
- To treat metastatic cancer, especially if it is growing rapidly or causing severe symptoms (palliative chemotherapy)

Chemotherapy regimens

The idea of combining more than one chemotherapy drug is to target multiple processes in the cancer cells all at once, with the hope of killing as many of them as possible. There are numerous standard chemotherapy regimens available; the regimens that would be most suitable for you may depend on many different factors.

After surgery, your healthcare team will determine if chemotherapy is an option based on the level of risk of recurrence; these include:[127]

- Size and grade of the tumour
- Lymph node association
- Lymph vessel and blood vessel association
- Hormone receptor status
- HER2 receptor status
- If the cancer has a high or moderate risk of recurrence
- If the tumour has a high genomic profile test score
- Your overall health, as some chemotherapy drugs interfere with certain medical conditions such as heart disease

The healthcare team will also take into consideration:

- The purpose of the regimen (neoadjuvant, adjuvant, or palliative therapy)
- The previous treatment(s) you have had
- The likely side-effect profile of the regimen
- The availability of the regimen at your cancer centre
- Coverage or approval of the regimen in your province or territory
- Your cancer centre's experience with the regimen (e.g., your centre may be involved in a clinical trial testing a new regimen)
- In some cases, your own personal preferences
- Your general level of health—performance status

Your cancer specialist (usually a medical oncologist) will discuss your options with you (including the possibility of enrolling in a clinical trial, where available). Remember to ask your doctor and your team any questions or concerns that you may have.

Table 7. Some commonly used chemotherapy regimens for early-stage breast cancer (adjuvant) [125, 128]

Regimen	Components	Typical schedule
TAC (AC-docetaxel)	Docetaxel (Taxotere®) Doxorubicin (Adriamycin®) Cyclophosphamide (Cytoxan®, Procytox®)	Usually given every 21 days for 6 cycles; treatment usually lasts 18 weeks. This combination usually requires colony-stimulating factor (CSF) drugs to lessen side effects.
AC+T	Doxorubicin Cyclophosphamide Paclitaxel (Taxol®)	4 cycles of AC given every 14 or 21 days, followed by 12 cycles of paclitaxel given weekly; treatment lasts about 5 to 6 months.
AC+T (Dose-dense)	Doxorubicin Cyclophosphamide Paclitaxel	Given every 2 weeks—4 cycles of AC and 4 cycles of paclitaxel (total 8 cycles). This combination requires colony-stimulating factor (CSF) drugs to maintain white blood cell counts.
AC followed by paclitaxel (Dose-dense) + trastuzumab	Doxorubicin Cyclophosphamide Paclitaxel Trastuzumab (Herceptin®)	Given every 2 weeks—4 cycles of AC and 4 cycles of paclitaxel (total 8 cycles) + trastuzumab given either weekly or every 21 days. Trastuzumab can be given concurrently with paclitaxel or after.
AC followed by carboplatin/ paclitaxel	Doxorubicin Cyclophosphamide Paclitaxel Carboplatin (Paraplatin®)	This combination is the same as AC+T but with the addition of 4 cycles of carboplatin, for the treatment of some triple negative cancers.
FEC[127]	Fluorouracil (5-FU; Adrucil®) Epirubicin (Pharmorubicin®) Cyclophosphamide	Usually given every 21 days for 6 cycles; treatment lasts about 5 months
AC (DC)	Doxorubicin Cyclophosphamide	Usually given every 21 days for 4 cycles; treatment lasts about 3 months.
TC	Docetaxel Cyclophosphamide	Given every 3 weeks for 4 cycles; treatment lasts about 3 months. This combination requires CSF drugs to maintain white blood cell counts and reduce the risk of fever and infection.

CMF	Cyclophosphamide Methotrexate Fluorouracil	Cyclophosphamide is given as a tablet daily for 14 days each 28 days for 6 cycles. Methotrexate and fluorouracil are usually given every 28 days for 6 cycles; treatment lasts about 6 months.
FEC-D	Fluorouracil Epirubicin Cyclophosphamide + Docetaxel	FEC is given every 21 days over 3 cycles, then docetaxel is given every 21 days for another 3 cycles
FEC-TH	Fluorouracil Epirubicin Cyclophosphamide + Docetaxel Trastuzumab	FEC for 3 cycles of 21 days, then docetaxel + trastuzumab for 3 cycles of 21 days. Afterwards, trastuzumab alone for another 15 cycles every 21 days. Treatment lasts about 1 year.
TCH	Docetaxel Carboplatin Trastuzumab	TCH for 6 cycles every 3 weeks, then trastuzumab alone for 12 cycles every 3 weeks. Treatment lasts about 1 year.
APT	Paclitaxel Trastuzumab	Paclitaxel given weekly for 12 cycles + trastuzumab given every 21 days for 1 year
Agents used alone or in combination with others		
Vinorelbine (Navelbine®) Paclitaxel (Taxol®) Gemcitabine (Gemzar®) Capecitabine (Xeloda®) Docetaxel (Taxotere®)		

Newer Approaches:

Research is ongoing into the addition of immunotherapies (with chemo) for some patients, particularly with triple negative breast cancer.

Pertuzumab (HER2 targeted treatment similar to trastuzumab) may improve responses in addition to trastuzumab ("H" in above regimens) when given neoadjuvantly (preoperatively).

Chemotherapy side effects and their management

The toxicity on normal cells resulting from chemotherapy is responsible for the side effects. **It is important for you to know that normal tissues are usually able to recover after chemotherapy** and that, contrary to popular belief; the side effects are usually tolerable and manageable. You may have only some of the known side effects, and most of the time, it is possible to reduce or eliminate them with effective medications (e.g., drugs to combat nausea) and other techniques such as meditation or relaxation.

Each of the chemotherapy agents used in a regimen has a slightly different side-effect profile. Sometimes the most effective regimens, which use higher doses of chemotherapy drugs, may also cause more side effects. Everyone will experience side effects differently and at different times. In this section, we will review some common side effects.

Hair loss

Hair loss is a common side effect of chemotherapy. Hair follicles contain rapidly dividing cells, and this is why some chemotherapy regimens cause hair loss (also known as alopecia). Many patients fear hair loss more than any other side effect. However, for most people hair usually grows back, though often with a different texture than before (initially).

Meanwhile, you might want to consider buying some scarves, hats, or a wig before you begin your course of chemotherapy. You can access the Canadian Cancer Society for boutique hair and wig programs. Some people may consider cutting their hair very short or even shave their head when they start to lose their hair. These steps can help you feel more in control of your appearance and in control of the disease itself.

CONTACT AN EMERGENCY DEPARTMENT OR YOUR DOCTOR IF…

Some side effects are potentially more serious than others. The following may be signs of an allergic reaction to a chemotherapy regimen that may be life-threatening.

Proceed to an emergency department immediately (potentially after contacting your treating cancer centre) if any of these occur:

- Severe and sudden itching
- Rash or hives
- Wheezing or trouble breathing
- Fever above 38˚C

Contact your family doctor or cancer centre if you have any of the following:

- Severe vomiting or diarrhea
- Unexplained bleeding

Fatigue

Fatigue is a very common side effect of chemotherapy. It can be a result of the drugs themselves (see also *Anemia*), recent surgery, pain, poor appetite or nutrition, dehydration, nausea, lack of sleep, or the stress of being diagnosed with cancer. Often, fatigue is the last symptom to resolve post-chemotherapy but for some fatigue may last months or years. Many patients find fatigue a difficult symptom to manage. It may last for a few days with each cycle or may persist until several weeks after all treatment has been completed.

Some suggestions to overcome fatigue may include:

- Trying to get enough sleep
- Eating well
- Minimizing stress at home and at work whenever you can
- Using relaxation therapies and meditation
- Practicing moderate exercise, which has been shown to help with fatigue and quality of life on chemotherapy generally

Mucositis (oral) or stomatitis

Mucositis (oral) is the inflammation of the mucous membranes in the mouth. Stomatitis is the inflammation of the oral tissues. These can include the gums, tongue, cheeks, and the lips. These terms are used interchangeably and the symptoms can vary from mild to severe.[126]

The lining of the mouth, like the rest of the digestive tract, is made of rapidly dividing cells. Mouth sores and tenderness are common side effects that may appear several days after your chemotherapy starts, especially if your white blood cell count is low (see also *Neutropenia*).

Things you can do include the following:

- Limit food and drinks that may cause dry mouth or dehydration (such as alcohol)[126]
- Avoid foods that may irritate the inside of the mouth or throat
- Eat smaller and frequent meals that are soft, less acidic, and warm[126]
- Get a dental checkup and cleaning before starting chemotherapy (but not after chemotherapy starts unless you check with your healthcare team)
- Try to maintain good oral hygiene and use a soft toothbrush
- Try a mild alcohol-free mouthwash, especially one that contains some pain relievers and antifungal agents to help control infections like candidiasis (thrush)
- Try club soda rinses (or baking soda and water)

Nausea and vomiting

If you have any nausea and vomiting, it will usually happen on the day of receiving or a few days after you receive chemotherapy. If you vomit, be sure to drink plenty of fluids to avoid getting dehydrated.

Nausea and vomiting can be classified into:[126]

- Acute: occurring in the 24 hours after chemotherapy
- Delayed: occurring more than 24 hours after chemotherapy
- Anticipatory: occurring before your next chemotherapy, as your brain associates sights or sounds with the chemotherapy treatment.

Fortunately, we have several anti-nausea medications that can reduce or even prevent these symptoms when they are taken before and shortly after chemotherapy. If your nausea persists despite these medications, your doctor may suggest other medications.

Diarrhea or constipation

Chemotherapy regimens may cause diarrhea because they damage the rapidly dividing cells that line the digestive tract. Diarrhea is characterized with the frequent passing of watery loose stools with two or more loose stools in 4 hours. Severe diarrhea is when you have 7 to 8 loose stools in 24 hours.[126] It can usually be managed with nonprescription anti-diarrhea drugs, and by drinking plenty of fluids to avoid getting dehydrated (losing too much body fluid). If your diarrhea is severe, always let your doctor know; you might need to be hospitalized to reverse medically serious dehydration and electrolyte imbalance.

Constipation is when the stool becomes hard, dry and difficult to pass. It often occurs for a few days after the administration of chemotherapy and anti-nausea drugs. Stool softeners and laxatives may need to be used with each cycle of chemotherapy to ensure your bowel routine stays regular. Constipation that is not well controlled can worsen the sensation of nausea. Again, if constipation becomes an issue, let your healthcare team know before it worsens. You should not use suppositories (laxative-type or other) while on chemotherapy.

Cystitis[130]

Certain chemotherapy drugs, especially one called cyclophosphamide, can cause inflammation of the bladder (cystitis.) The byproducts of this drug are eliminated in the urine and can irritate the lining of the bladder. This irritation can cause inflammation, bleeding, and infections. Some can experience a burning sensation or pain when urinating, see blood in the urine, or have a need to urinate often, difficulty urinating, and at times incontinence.[127]

Your healthcare team may administer extra fluids during chemotherapy to help protect the bladder from these symptoms. In addition, you should drink at least 8 glasses of fluid daily and ensure that you empty your bladder frequently during the first 24 hours after a chemotherapy dose. If you receive your chemotherapy late in the day, continue drinking fluids and empty your bladder even during the night. In the event you experience burning or increased frequency of voiding, it is important to check in with your doctor to ensure you do not have a bladder infection.

*Some chemotherapy drugs such as doxorubicin and epirubicin cause red-coloured urine, which is not the same as blood in the urine.

Neutropenia (low white cell count)

Your blood contains several types of white blood cells, including neutrophils, which play an important role as part of the immune system in fighting bacterial infections. If you receive chemotherapy, you are very likely to develop neutropenia—a drop in the number of white blood cells—but the degree of neutropenia varies greatly.

If your **neutropenia is slight**, you do not need any specific treatment for it, and your white cell count will rapidly return to normal.

If your **neutropenia is severe**, you may be vulnerable to serious or even life- threatening infections.

This is why your white blood cell counts are closely monitored and checked on the day (or day before) you are scheduled to start each cycle of chemotherapy. If you have neutropenia, it may be necessary to postpone your next chemotherapy cycle or reduce its dose to allow your white cell counts to recover.

If you have neutropenia and develop a fever higher than 38˚C (febrile neutropenia) or other symptoms of infection, you may need to be admitted to hospital and given intravenous antibiotics or treated as an outpatient with oral antibiotics. The risks of developing neutropenia depend largely on the chemotherapy regimen you are receiving. Severe neutropenia requiring treatment is more common if you are older and if you are receiving an intensified chemotherapy regimen.

The chances of developing febrile neutropenia can be reduced by using treatments that stimulate the growth of white blood cells called colony–stimulating factors (CSFs). CSFs are a supportive medication used to decrease the risk of febrile neutropenia during your chemotherapy, thus helping to avoid having to delay your next chemotherapy cycle or reduce its dose. If you receive a chemotherapy regimen that is known to cause severe neutropenia or if you have already had a bout of severe neutropenia, your doctor may recommend a medication like filgrastim or pegfilgrastim (administered as injections) with your chemotherapy treatment.[131]

Anemia[132]

The red blood cells in your body contain hemoglobin, which gives blood its characteristic red colour; a major function of hemoglobin is to carry oxygen to the tissues of the body. A decrease in your red cell count (known as anemia) can leave you feeling unusually tired and lacking in energy. Mild or moderate anemia is commonly seen with some chemotherapy regimens. It is not life-threatening and usually does not require treatment. If your anemia becomes severe, as it can when treatment with certain regimens is prolonged, you will need treatment, usually with a blood transfusion or a red blood cell growth factor.

If your symptoms of anemia develop rapidly, blood transfusions will increase your red cell count immediately (although they may need to be repeated); however, they may cause allergic reactions or, rarely, destruction of red blood cells or infections.

Thrombocytopenia (low platelet count)[133, 134]

Besides white cells and red cells, your blood contains small structures called platelets, which help to prevent bleeding. Chemotherapy can cause your platelet count to drop (thrombocytopenia), but severe thrombocytopenia is unusual with most of the chemotherapy drugs used to treat breast cancer.

If severe thrombocytopenia develops, it can cause bruising on the skin and bleeding from the gums, the urinary tract (blood in the urine), or the digestive tract (blood in the stool, tarry black-coloured stool, or vomiting of material that is black or looks like coffee grounds).

If your platelet count is very low or if you have these symptoms of bleeding, you should not drink alcohol or take ASA (Aspirin), ibuprofen (Advil™) or naproxen (Aleve™) and your doctor may recommend a platelet transfusion. Transfusions are rarely required.

Peripheral neuropathy

Numbness, a burning sensation, or tingling ("pins-and-needles") in your hands and feet may be an indication of nerve damage from your chemotherapy regimen—a condition referred to as peripheral neuropathy. This could be accompanied by decreased sensitivity (for example, to hot or cold, or sharp objects), as well as a decline in muscle strength or control (for example, difficulty with small tasks such as buttoning a shirt). In most instances these symptoms subside after chemotherapy; however for some people, they may persist for several months or even longer or be permanent.

Talk to your doctor if you are experiencing any of these symptoms: a change in chemotherapy may be in order, or a lowering of dose. There are a number of protective measures you can take, such as:

- The use of no-slip mats in the shower
- The use of gloves and socks to protect you from extreme cold or heat
- In severe cases, rehabilitation may be required with an occupational therapist and physical therapist.

Allergic reactions[135]

Some people may experience an allergic reaction to certain chemotherapies such as paclitaxel (Taxol) or docetaxel (Taxotere). Symptoms may include difficulty breathing, wheezing, skin rash or hives, or in severe cases, anaphylaxis. Even in such cases, however, such reactions may be avoided with the use of pre-medications (preventive drugs taken prior to chemotherapy). It is important to discuss with your healthcare team any current medication or allergies you may have prior to starting chemotherapy.

Cognitive impairment

Also known as chemo fog or chemo brain. The chemotherapy dose and frequency may cause some people to develop difficulties with memory, attention, or problem solving (thinking and rationalizing).[136,137] Some people will develop changes in communication and learning as well.[136, 137] Cognitive impairment is very individualistic; not everyone who undergoes chemotherapy will experience a similar level of impairment. These impairments may last days or even months after treatment depending on the severity of the impairment. Chemo fog can also affect behavior and emotions such as mood swings, irrational behaviour, confusion, anger, and crying.[137]

Management of these symptoms if they do not resolve on their own can be supplemented with:[136,137]

- Medication—stimulants or antidepressants
- Cognitive rehabilitation and training
- Occupational therapy and vocational rehabilitation
- Counselling and support

It is important to speak to your healthcare team if you notice these symptoms. This will help the healthcare team develop strategies with you to support your recovery.

Nail changes

Some drugs may cause changes to the nails on your fingers and toes: for example, their colour may darken or turn yellow, lines may appear, they may become brittle and prone to cracking, and sometimes fall off. Don't be alarmed—these changes will start to improve once treatment is over (although full restoration of nails may take a number of months).

You can manage these side effects by:

- Maintaining your nails by keeping them trimmed and clean, but avoid tools to dig under nails
- Preventing biting or tearing your nails
- Using nail paint to strengthen and cover the discolouration
- Massaging cuticles
- Avoiding professional manicures and artificial nails; these are not recommended.

Discuss your symptoms with your healthcare team if you notice changes or infections on your nails.[138]

Body aches and pains

Certain chemotherapies, such as docetaxel and paclitaxel, can cause aches and pains to your bones or joints. In some cases, these may be severe and persist for several days after treatment. Your healthcare team can help you find the appropriate medications to relieve the pain. Again, such side effects are often transient, and should diminish once therapy is completed.

(For a list of all supportive medications *see page 110: Name that medication.*)

Long-term side effects of chemotherapy

Early (premature) menopause

If you are premenopausal when you begin chemotherapy, your periods may stop and not return, especially if you are over 45 years old.

Leukemia (rare)

Leukemia is cancer of the white blood cells in blood and bone marrow (myelodysplastic syndrome or acute myeloid leukemia). This side effect is seen within 10 years of completion of chemotherapy.[139] Thankfully, this it is a very rare side effect.[140]

Heart (cardiac) problems (rare)

Rarely, doxorubicin and epirubicin have caused heart failure [135] or permanent heart damage (cardiomyopathy). The risk increases with long term use of high doses.[139] The doses of these medications used in chemotherapy regimens for breast cancer are designed to be within the safe range determined by your healthcare team. There are maximal cumulative lifetime doses for these so, should you require chemo for breast or another cancer later in life, those drugs may best be avoided. Sometimes, biological treatments such as trastuzumab may affect the heart, usually transiently, and they require periodic heart scan monitoring.[141] Especially if you have had previous heart disease risk factors such as family history of heart disease, hypertension, and diabetes, your doctor may monitor your heart with an echocardiogram (an ultrasound test) or a heart scan (MUGA). If you need treatment for heart problems, your chemotherapy may be postponed or changed to a different regimen.

TARGETED THERAPIES

Chemotherapy and radiation treatment share a key drawback: they inevitably damage normal cells along with the cancer cells. Hence, their doses have to be limited. **Some newer therapies work on the principle of targeting cancer cells by focusing on certain biological processes essential to cancer survival or certain receptors** (special proteins) on their surfaces that are different, either in type or in amount, from the receptors found on normal cells.

One method of targeting cancer cells is to use immune therapies. Antibodies are special proteins made by the immune system that normally help to fight invaders like bacteria or viruses; antibodies against cancer cell receptors can also be made in the laboratory.

HER2 – targeted therapies

HER2 is the human epidermal growth factor receptor. HER2 positive (HER2+) breast cancer is known for the overexpression of the HER2 protein. The targeted therapies for HER2 attach to the overexpressed HER2 proteins, preventing the growth of HER2+ breast cancer cells.[142,143]

Trastuzumab (Herceptin and other brands) is a common targeted therapy. (For more details about HER2, see page 23: *HER2 status.*) Up to about 15 to 20 percent of all women with breast cancer have HER2 positive tumours (that is, the cancer cells express too much HER2).

Trastuzumab, in combination with chemotherapy drugs, is used in people with early breast cancer after surgery and may also begin before surgery.[142] Once chemotherapy is completed, further trastuzumab is given for up to a total of one year. It can be given with chemotherapy and on its own (after chemotherapy) in people with metastatic breast cancer.[142,143] For metastatic breast cancer this treatment is continued until the cancer stops responding. Trastuzumab is given intravenously, and the exact dose and schedule varies from patient to patient.

Side effects of trastuzumab are uncommon and can include cardiotoxicity.[144] Every patient has heart function testing before starting treatment and is tested again during trastuzumab therapy.[145] If heart issues arise, they are generally reversible when treatment is suspended or stopped. Certain heart medications may also be used to limit this risk or improve heart function.

Pertuzumab (Perjeta™)[144] is another similar antibody treatment administered intravenously in combination with trastuzumab. It can significantly improve short term responses and long-term outcomes.

- It is given to people with HER2 positive metastatic breast cancer with no previous HER2 treatment or chemotherapy for metastatic disease.
- Pertuzumab may also be used in combination with trastuzumab and chemotherapy for neoadjuvant (or adjuvant in rare circumstance) treatment for patients with HER2 positive early breast cancer

Trastuzumab emtansine (Kadcyla)[144] is administered intravenously. It essentially is trastuzumab with a chemo agent riding "piggy back", for delivery specifically to HER2 positive cancer cells.

- Trastuzumab emtansine is used in treatment for patients with HER2 positive metastatic breast cancer who received both prior treatments with trastuzumab and a taxane chemo agent separately or in combination, who have either received prior therapy for metastatic disease or have developed disease recurrence during or within 6 months of completing adjuvant therapy.
- It is also used as adjuvant treatment of HER2 positive early breast cancer in patients who have residual invasive disease following neoadjuvant taxane and trastuzumab-based treatment

Side effects can include fatigue, nausea, vomiting, musculoskeletal pain, low white blood cell count, infection, low platelet count, bleeding, peripheral neuropathy (numbness/tingling), dyspnea, constipation, and mucositis.[14]

Oral HER2 targeted therapies:

Lapatinib (Tykerb™) is an oral drug that targets the HER2 receptor, as well as another growth- signaling receptor called the epidermal growth factor receptor (EGFR). Other similar drugs include **neratinib** (Nerlynx™) and **tucatinib** (Tukysa™).

- They are often used in combination with capecitabine (Xeloda) chemotherapy (and in combination with trastuzumab or tucatinib) and given to people with metastatic HER2 positive breast cancer when chemotherapy with trastuzumab is no longer effective.[144]

Side effects may include, diarrhea, nausea, vomiting, fatigue, mucositis, bleeding, altered taste sensations, rash, itching, anorexia, weight loss, and infusion related reactions.

HR+: targeted therapies

Hormone receptor (HR) positive breast cancer is a common form of breast cancer where the cancer cells have receptors that receive signals from estrogen and/or progesterone hormones. These hormones control the breast cancer cell growth. Breast cancer hormone status can be estrogen receptor positive (ER+) or progesterone receptor positive (PR+).

Mammalian target of rapamycin (mTOR) inhibitors[142] block the mammalian target of rapamycin (mTOR). The mTOR protein regulates cell growth and cell reproduction. The function of mTOR inhibitors is to block the action of mTOR in controlling the growth of cancer. Everolimus is a mTOR inhibitor.[142]

Everolimus (Afinitor™)[142] is administered orally in postmenopausal women with HR-positive, HER2-negative advanced breast cancer in combination with exemestane after recurrence or progression following treatment with letrozole or anastrozole.[142]

Side effects can include mucositis, fatigue, cough, dyspnea, diarrhea, rash, nausea, vomiting, anorexia, weight loss, fluid retention, headache, and rarely inflammation of the lung. [144]

Cyclin-dependent kinase inhibitor (CDK4/6)

Abemaciclib, palbociclib, and ribociclib are CDK4/6 inhibitor drugs used in metastatic ER and/or PR+ breast cancers, with hormonal therapies. CDK4/6 are proteins that control how fast cells grow and divide in the cell cycle.[142] CDK4/6 inhibitors work to block these proteins, to slow or stop cancer cell growth. All three drugs are taken orally but with varying schedules. Your healthcare team will advise you on how to take these drugs based on your treatment plan. [142] They have been found to dramatically improve the benefits of hormonal therapies, with higher response rates and much longer-lasting benefits on disease control. Most patients tolerate them very well.

Abemaciclib (Verzenio™)[142,144] is taken orally for the treatment of hormone receptor HR positive, HER2 negative advanced or metastatic breast cancer:

- In combination with an aromatase inhibitor in postmenopausal women as initial hormonal therapy
- In combination with fulvestrant in women with disease progression following hormonal therapy.

Side effects may include diarrhea, infection, fatigue, nausea, vomiting, liver irritation, limited alopecia, anorexia, weight loss, increased creatinine, headache, constipation, increased risk of blood clots, and rarely inflammation of the lung.[144]

Palbociclib (Ibrance™)[144] is taken orally for the treatment of HR positive, HER2 negative locally advanced or metastatic breast cancer in combination with:

- An aromatase inhibitor as initial hormonal therapy in postmenopausal women or men
- In combination with fulvestrant in patients whose disease progressed after prior hormonal therapy
- Pre- or peri-menopausal women must also be treated with a luteinizing hormone releasing hormone (LHRH) agonist in addition to an aromatase inhibitor

Side effects may include low white blood cell count**,** infection, bleeding, fatigue, nausea, vomiting, mucositis, headache, diarrhea, constipation, liver irritation, limited alopecia, rash, pruritus, anorexia, and rarely inflammation of the lung.[144]

Ribociclib (Kisqali™)[144] is taken orally for use in combination with letrozole for the treatment of premenopausal and postmenopausal women, or men, with HR positive, HER2 negative advanced or metastatic breast cancer in combination with:

- An aromatase inhibitor as initial hormonal therapy in postmenopausal women or men
- In combination with fulvestrant in patients whose disease progressed after prior hormonal therapy
- Pre- or peri-menopausal women must also be treated with a luteinizing hormone releasing hormone (LHRH) agonist and an aromatase inhibitor

Side effects may include infection, bleeding, nausea/vomiting, fatigue, diarrhea, liver irritation, QTc prolongation, limited alopecia, constipation, headache, musculoskeletal pain, increased creatinine, and rarely inflammation of the lung.[145]

BRCA 1/2

All people have both BRCA1 and BRCA2 genes. BRCA1/2 are known as suppressor genes, which help repair DNA that leads to uncontrolled cancer growth.[141] These genes can become altered, and a gene mutation occurs. BRCA 1/2 gene mutation carriers are more likely to develop into breast cancer. [142]

Olaparib (Lynparza™)[144] is taken orally for the treatment of adult patients with deleterious or suspected deleterious germline BRCA-mutated (gBRCAm) breast cancer.

- Patients with HER2 negative metastatic breast cancer who have previously been treated with chemotherapy in the neoadjuvant, adjuvant, or metastatic setting.
- Patients with metastatic HR positive breast cancer should have progressed on or be considered inappropriate for hormonal therapy.[144]
- Triple negative breast cancer: Olaparib can be used as a first line treatment for metastatic disease.
- Recent research suggests it may have adjuvant value after completing adjuvant chemotherapy.

Side effects may include nausea, vomiting, fatigue, anemia (sometimes requiring transfusion), increased creatinine, diarrhea, headache, decreased appetite, low white blood cell count, infection and bleeding, cough and dizziness. The most common severe adverse event is anemia.[144]

(For a list of all targeted therapies *see page 93: Name that medication.*)

IMMUNOTHERAPY

Immunotherapy is a treatment that stimulates and engages your immune system to defend against cancer. Immunotherapy is used in breast cancer treatment for advanced or metastatic triple negative breast cancer.[146,147]

Your healthcare team may offer immunotherapy to:[146]

- Destroy breast cancer cells
- Prevent the tumour from growing and spreading
- Control symptoms in metastatic breast cancer

Immune checkpoint inhibitors

Your immune system cells make proteins called checkpoints, which prevent the immune system from attacking normal cells in the body.[146,147] These checkpoints are responsible for starting and stopping immune responses in the body.[146,147] Breast cancer cells use these same checkpoints to avoid being attacked by the immune system.

Immune checkpoint inhibitors are drugs that block the checkpoint proteins and allow immune system cells to attack and destroy cancer cells.[146,147] Their role in the treatment of breast cancer remains an area of active research.

Atezolizumab (Tecentriq™)[146,147] is a checkpoint inhibitor drug that targets PD-L1 proteins found on tumour cells and some immune cells. This drug is administered intravenously through an IV infusion.

Atezolizumab can be used in combination with chemotherapy nab-paclitaxel (Abraxane™) when treating advanced or metastatic triple negative breast cancer with the PD-L1 protein.[146,147]

Pembrolizumab (Ketruda™) is a checkpoint inhibitor drug that targets PD-1 proteins found on tumour cells and some immune cells. This drug is administered intravenously through an IV infusion.

Pembrolizumab can be used in combination with chemotherapy paclitaxel or a platinum chemotherapy combination when treating advanced or metastatic triple negative breast cancer.

Side effects may include diarrhea, fatigue, thyroid dysfunction, cough, nausea, skin rash, decreased appetite, constipation, fever, and low white blood cell counts.[146,147]

Speak to your healthcare team if you experience any side effects during, in between, or after treatments. These effects may be short term or if long term, can be treated. There is a very low but possible risk of your immune system being over activated and attacking any one of your organs.

WHAT ABOUT COMPLEMENTARY, ALTERNATIVE, AND INTEGRATIVE THERAPIES?

Complementary therapy

Complementary therapies work alongside conventional medicine and are often used to reduce side effects. **It is important to discuss with your oncologist any complementary therapies that you are considering**. While some can be helpful, there can be therapies that can cause serious, life-threatening toxicities. The use of vitamins and supplements during chemotherapy have been shown to decrease the effectiveness of treatment and should be avoided unless discussed with the oncology team.[148]

Many people are interested in investigating various alternative or complementary therapies. Many non-drug therapies like meditation, relaxation, and visualization can help a great deal to reduce the stress and anxiety of having cancer and to maintain a positive attitude. Your healthcare team or support group can help you find workshops that teach these techniques.

An overview of some common complementary therapies is discussed on the CBCN website at cbcn.ca/complementary_therapy.

Alternative therapy

Alternative therapies are unconventional therapies, which are used in place of conventional cancer treatments.

Understandably, you may be enticed by a claim that an unproven "natural" remedy may cure cancer. Quite a number of the standard medications used today were originally related to products found in nature—but the difference is that, unlike unproven natural remedies, **medications have been rigorously tested by researchers to ensure that they are as effective as they claim to be**. If you want to experiment with natural medicines, vitamins, herbal remedies, or other unproven therapies advertised as cures for cancer, consider that these therapies:

- Have not been scientifically tested
- May conflict with the treatment that your team has prescribed, just as some medications interfere with each other or cause reactions when taken together
- May contain unknown products or additives that may also conflict with your prescribed treatment
- Your conventional healthcare team may not be aware of how or if alternative therapies are beneficial to your care[149]
- Your healthcare team may not support the use of alternative therapies due to limited knowledge, research or clinical studies used in breast cancer treatments[149]

Integrative care

Integrative care is a combination of regular (conventional) cancer therapies and complementary cancer therapies used to help treat cancer patients.[149] Integrative care occurs under the supervision of practitioners from both fields monitoring the effectiveness of both therapies given simultaneously.[149] Integrative care involves decisions to be made about your care from both conventional practitioners and from complementary practitioners.

Most Canadian cancer centres are not currently using integrative programs but do offer some complementary therapies.[149] Consult with your healthcare team for more information if integrative care is something you are interested in or if you have any questions about it.

KEY SUPPORTIVE THERAPIES IN BREAST CANCER

Bone health and osteoporosis in breast cancer[150]

People with breast cancer may develop osteoporosis (loss of bone density) for several reasons. It is important to know that your bones are living tissues that—in very slight amounts—are constantly being dissolved (resorbed) and rebuilt throughout your life. If more bone is resorbed than rebuilt, over time the structure of the bone becomes thinner, more fragile, and more prone to breaking (fracturing).[151]

The common locations for high-risk bone breakage due to osteoporosis is in the **hips, pelvis, spine, ribs, wrists, and legs**.[152]

Estrogen

The hormone estrogen plays a role in keeping the bones strong[152] and tends to slow the resorption of bone, which is why women generally are more prone to developing osteoporosis when their estrogen levels decline after menopause.[153] With many breast cancers, an important treatment goal is to decrease estrogen levels or block estrogen from working. On the other hand, **decreasing working estrogen levels may increase the risk of osteoporosis.**

Hormonal treatment

Most hormonal treatments used in breast cancer may block or lower estrogen and testosterone (male sex hormone), which have a role in strengthening our bones.[154] This can cause osteoporosis, as do many chemotherapy regimens (the latter by causing premature menopause).[155]

Osteoporosis prevention

Calcium and Vitamin D

As part of combating the risk of osteoporosis, you should maintain a healthy intake of calcium and vitamin D, which is needed for your body to uptake calcium.[150]

Calcium in the diet comes mainly from dairy products, while eggs and fatty fish contain lots of vitamin D. You may also benefit from taking daily calcium and vitamin D supplements for your bone health. (For calcium, diet and supplements should add up to a maximum of 1,500 mg daily. For vitamin D, a daily intake of 1,000 to 2,000 IU is recommended. If you use a nonprescription supplement, make sure you check the amount of *available* calcium in the product you are taking, not just the total calcium content—the amount of calcium available for your body may be less than the total amount of calcium in the product.)

Exercise

On top of this, while physical exercise (such as weight-bearing, strengthening, and stretching exercises) helps prevent osteoporosis, your treatments may fatigue you so that your usual level of activity may decrease. All of these factors put you at an increased risk of osteoporosis.[152]

If you have osteoporosis, you may lose height or develop a stooped posture over time; you may also have bone tenderness or pain. On the other hand, osteoporosis can cause no symptoms at all for years, but your brittle bones may put you at increased risk of fracture. Therefore, especially if you are taking an AI (aromatase inhibitor), you should have a bone density scan at least once every 2 years. Your doctor may recommend you have the test done before starting hormonal therapy or chemotherapy.

Bisphosphonates are a class of drugs used to treat or prevent osteoporosis in postmenopausal women by strengthening the structure of the bone tissue and stopping the body from breaking down the bone.[154]

Oral agents (risedronate and alendronate) are often prescribed by family physicians and are taken once weekly or once monthly. Clinical trials have shown that they can also help to reduce the risk of developing osteoporosis in women with breast cancer who are taking hormonal therapies or chemotherapy.

For postmenopausal patients with early-stage breast cancer, an intravenous agent (zoledronic acid) usually given every 6 months for 3 years may prevent bone density loss and also reduce the risk of metastatic cancer spread by another 3 to 4 percent.

Denosumab (Prolia™ or Xgeva™) is a treatment for osteoporosis—a human monoclonal antibody that counters a receptor in bone tissue that would usually stimulate bone to be resorbed (anti-re-absorptive therapy).[155] It is given by injection under the skin twice a year.[157, 158] This drug works to treat osteoporosis and reduces the risk of bone fractures in postmenopausal women with osteoporosis.[158,159]

(For a list of all osteoporosis prevention and treatment medications *see page 93: Name that medication.*)

Bone health in people with bone metastases[160]

Metastasis is a process wherein breast cancer spreads to other parts of the body, such as the bones. Cancer can damage bones by creating small holes or by triggering abnormal bone growth, causing the bone to become painful and fragile, and potentially to fracture (break), even without warning.

- The weight-bearing bones—the femur (thigh bone) and humerus (arm bone) are at especially high risk of breaking if the cancer has spread to them.
- Cancer that has spread to the spine can also compress the spinal cord, causing serious symptoms, or cause weakened vertebrae (bone segments of the spine) to collapse on themselves.

Also, calcium from the bone may be released into the bloodstream at an abnormally high rate, causing symptoms like loss of appetite, thirst, nausea, fatigue, increased urination, weakness, and confusion.

If your disease has spread to bone tissue (stage IV cancer), you may develop bone problems such as pain, weakening of the bones, fractures, elevated blood calcium levels, or compression of the spinal cord causing paralysis; bone supportive therapies are given to decrease pain and risk of these complications.[155,156]

Bisphosphonates: These agents tip the balance in bone cells away from bone dissolving/recycling cells back towards bone building cells. Options include:

- Intravenous agents: zoledronic acid or pamidronate every 1 to 3 months
- Oral: Clodronate pills twice a day (not felt to be as potent)

Denosumab (Xgeva™ or Prolia™): a human monoclonal antibody that counters a receptor in bone tissue that would usually stimulate bone to be resorbed (anti-re-absorptive therapy).[154] It is given by injection under the skin monthly.

What are the treatment options to decrease the symptoms and complications of bone metastases?[161]

- Do what you can to **prevent falling**: remove physical hazards such as throw rugs, wear non-slip footwear, use railings on stairs, use a cane or a walker for extra support, and be especially cautious if you have to walk on an uneven surface or change posture (e.g., entering or exiting a vehicle).
- A short course of radiotherapy may help to relieve bone pain within about 1 to 2 weeks, and also help to reduce the chances that bone will be further destroyed. (For more about radiotherapy, see page 37: *Radiation therapy (radiotherapy).*)
- Adjusting your pain medications may also help. (For more about pain medications, see page 72: *About pain relief.*)
- Numerous surgical procedures may also be options for you. For example, a fractured hip bone can be stabilized by inserting metal rods into the bone, and a painful collapsed vertebra (segment of the spine) can be stabilized by injecting bone cement under local anesthesia.
- Bone supportive drugs may be prescribed as outlined above.

RECONSTRUCTIVE SURGERY AFTER MASTECTOMY[162]

Breast reconstruction is rarely needed after breast-conserving surgery, but you might want to consider it (instead of wearing a breast prosthesis) if you have had a mastectomy.

It is a personal choice; some women have breast reconstruction to feel whole again after losing a breast; to feel more comfortable, free, or attractive; or to have fewer reminders about their breast cancer.

Breast reconstruction sometimes involves more than one operation. Like nearly any surgery, the possible side effects may include pain, soreness, infection, bleeding, fluid buildup, and scarring.

Most provincial health plans cover some type of breast reconstructive surgery after mastectomy; check with your local facilities about the details.

"Reconstruction is not what everyone will tell you it is. It is hard. You have scars that can take years to go away, and it does affect your self-esteem. Try to find someone to talk to about it, and if you need to, talk to a professional. You don't realize how much this decision will affect you until you have gone through it and are looking back on your journey. After the reconstruction is when you start to process the mental portion of your journey and it can be daunting. Get help—it is out there!! Ask your oncologist or family doctor to refer you if need be but don't suffer in silence." Jo-Anna M.

As far as the timing of reconstructive surgery, it may be done together with the original mastectomy (avoiding an extra operation), but more often is done several months afterward, allowing the area to heal and time to deal with the cancer. This is especially true if you are having or have had radiation therapy, since reconstructive surgery that is done too close to radiation therapy may not give the best cosmetic results.

Visit CBCN's *SurgeryGuide* for further understanding of all options after surgery at cbcn.ca/surgeryguide.

Breast implants

One reconstructive option involves the use of breast implants. A breast implant is a rubberized silicone envelope, filled with sterile saline (salt water) or silicone gel, which is tucked into a naturally occurring pocket under the chest muscle. Sometimes this pocket is not large enough for the implant to fit in, so instead, an expander implant is used first. An expander implant is an empty bag with a small valve that can be filled with saline by injections through the skin. Small amounts of saline are injected into the expander implant every 1 to 2 weeks, until the overlying tissue has stretched enough to allow a regular implant to fit. Besides the usual risks of surgery, there is a small risk that breast implants can shift, wrinkle, change shape, or leak.[163] There is also a described very rare risk of implant associated lymphoma.

Autologous reconstruction

There are also a variety of methods for breast reconstruction that use your own tissue, giving the new breast a softer and more natural feel than breast implants.

Autologous tissue reconstruction involves taking tissue from another part of the body (abdomen, upper thigh, or buttocks) and using it to create a new breast.[164] Autologous tissue transfer is a much more complicated and longer procedure than implant reconstruction. It requires a significantly longer hospital stay, and a significant recovery period.[164]

Flap techniques

There are several flap techniques which involve bringing a segment of skin, fat, and muscle (along with the blood vessels supplying the segment) from another part of the body, under the skin, and into the chest area to build up the breast. The flap may come from various areas of the body—most often the abdomen (transverse rectus abdominis muscle [TRAM] flap) or the upper back (latissimus dorsi [LATS] flap).

Since muscle is transferred along with skin and fat, the donor site (abdomen or upper back) may be left weaker than before.

Nipple reconstruction

In 3 to 6 months, after the reconstructed breast settles into its final shape, the nipple and areola area (the darker area of the breast that surrounds the nipple) can be reconstructed. The nipple tissue can sometimes be taken from the opposite breast (nipple sharing), and the areola can be tattooed on the skin to match the opposite breast or grafted using a thin layer of skin from elsewhere on your body. While a reconstructed breast will not have many of the same qualities as the original breast, it can help you in your physical recovery.[165,166]

Deciding to stay flat

Some people will decide not to get breast reconstruction or use a breast prosthesis after a mastectomy. **Your decision to stay flat is a personal choice and one that makes you feel comfortable**.

Some people may choose to stay flat because:[167,168,169]

- Their overall health and other health circumstances which may affect breast reconstruction
- They do not want to undergo additional surgeries and recovery periods
- They do not want to experience the side effects of breast reconstruction surgery
- The reconstructed breast will not look and feel natural

"I researched all breast reconstruction options and when my surgery was booked - I cancelled a few days later. I just felt I needed more time and a break from surgeries. I never rebooked. That was 8 years ago, and I have no regrets. Do I have "breast envy" at times? Sure, I do, and I have a sense of humour about it. But I just didn't want another surgery and recovery time and I honestly don't feel less than because I don't have breasts." – Carmela B

People may have their own personal reasons for having breast reconstruction, using a breast prosthesis, or staying flat, or sometimes it may not be medically advisable.[167] **It is a decision that you make together with your plastic surgeon**, and it is important to address your concerns and questions with your healthcare team.

NOTES

TREATMENT OF BREAST CANCER BY STAGE

(For more details about staging breast cancer, see page 17: *Diagnosis and Staging of Breast Cancer.*) (For more details about judging the risk of recurrence, see page 27: *Looking Ahead*)
(For more details about each of the different treatment modalities (categories), see page 32: *Treatment modalities.*)

Treatment choices for pre-invasive breast cancer (DCIS or LCIS, stage 0)

Figure 9. Initial management of stage 0 breast cancer[5]

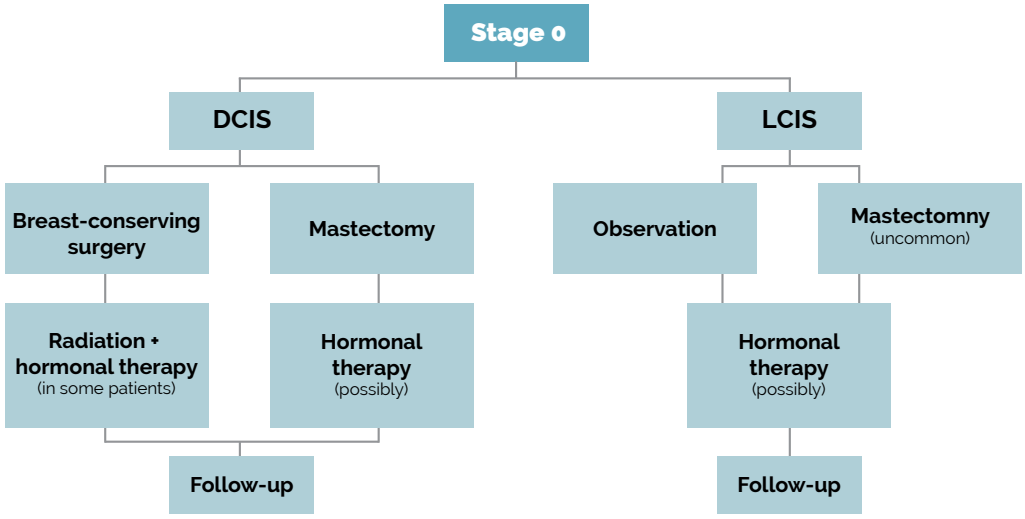


Figure 9 presents the management of stage 0 breast cancer. Recall that in the pre-invasive stage (stage 0), the cancer cells are in the lining of the ducts or the milk glands but have not spread into any surrounding tissue.

Lobular carcinoma in situ (LCIS)[5]

LCIS is not precancerous, but it is considered a risk factor for the future development of breast cancer in either breast. LCIS is not actually treated surgically but once found, should open a discussion with your doctor regarding the best ways to screen for cancer and whether preventive treatments like tamoxifen, aromatase inhibitors or even surgery might be appropriate. Regular subsequent breast monitoring with mammograms is important, sometimes with MRI.

Ductal carcinoma in situ (DCIS)[5]

The primary treatment for DCIS is surgery, usually with a lumpectomy (followed by radiation therapy) or a total mastectomy without radiation therapy.

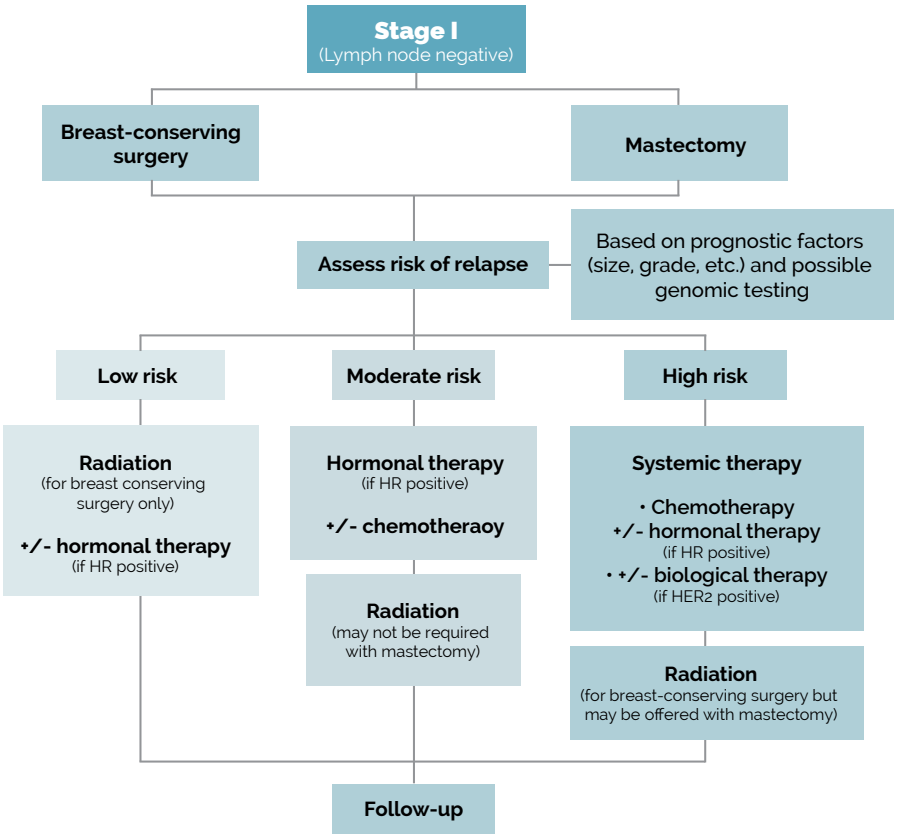
DCIS itself does not spread or cause death but can recur either as a second DCIS event or as an invasive cancer. Clinical trials have found that lumpectomy plus radiation therapy gives the same chance of survival as total mastectomy without radiation.[170] However, there is a risk that the cancer will recur, requiring a mastectomy after all.

If your tumour is hormone receptor positive, your doctor may recommend tamoxifen or aromatase inhibitor treatment to prevent recurrence of in-situ or invasive cancer, or a cancer in the other breast after a lumpectomy.[113]

The lymph nodes do not need to be removed routinely; a sentinel node biopsy may be performed especially in people who appear to have large areas of DCIS.

Treatment choices for early invasive breast cancer (node-negative, stage I)[5]

Figure 10. Node-negative treatment options (stage I)



Recall that stage I breast cancers are those with tumours less than 2 cm across that have not spread to the lymph nodes (so-called node-negative cancers). Figure 10 presents the treatment options for stage I tumours.

The treatments that are usually recommended for stage I breast cancer depend on several factors including the size, grade, hormonal receptor status, and HER2 status of the tumour.

The following are some key points about treatment for this stage:

Surgery is usually the primary treatment, whether breast-conserving surgery or mastectomy.

- Possible exceptions include certain hormone receptor–positive tumours if:
  - You are older and surgery is not an option for you

Radiation therapy is usually part of the treatment plan after breast-conserving, i.e., non-mastectomy surgery.

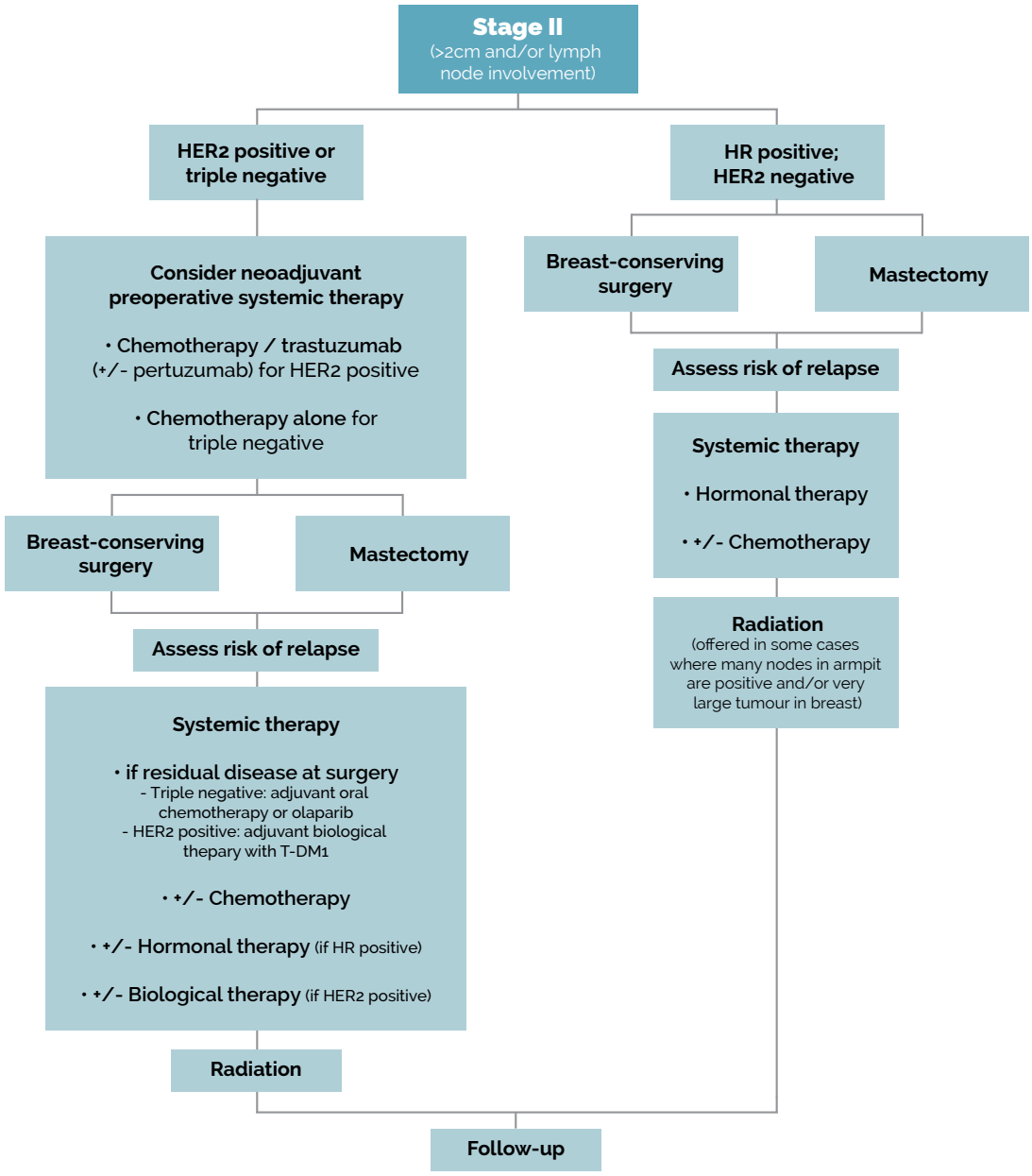
- If you are at low risk of recurrence, the surgery and radiation therapy may be all you need.
- If you are at moderate risk of recurrence, and your tumour is hormone receptor positive, you will probably also be offered hormonal therapy.

Chemotherapy is usually offered to you if you are at high (and sometimes moderate) risk of recurrence, along with surgery and radiation therapy.

- If your tumour is ER positive or PR positive, you will also be offered hormonal therapy.
- If your tumour is HER2 positive, you may also be offered biological therapy (with trastuzumab).
- If your tumour is triple negative, you may be recommended adjuvant chemotherapy

Treatment choices for stage II breast cancer

Figure 11. Treatment options for node-negative or node-positive breast cancer with >2 cm tumour (stage II)[5]



Recall that stage II breast cancers include tumours smaller than 2 cm across that have spread to a few lymph nodes, tumours 2 to 5 cm across which may or may not have spread to lymph nodes, and tumours more than 2 cm across which have not spread to any lymph nodes. This may sound like a "mixed bag" of tumour types, but they are all grouped under the same clinical stage because they are treated in similar ways. For treatment options for stage II breast cancer, see Figure 11.

Some key points about treatment of stage II breast cancer:

Surgery is again the usual primary treatment, whether breast-conserving surgery or mastectomy.

Chemotherapy may be offered to you in addition to surgery because many women with stage II disease have microscopic cancer cells elsewhere in the body that are too small to be detected with CT scans or other tests.

- Adjuvant chemotherapy is given after you have healed from surgery.
- Neoadjuvant chemotherapy can be given before surgery for large tumours and/or for HER2 positive and triple negative breast cancers, to shrink the tumour enough to make it possible to do breast-conserving surgery instead of mastectomy.

Hormonal therapy if your tumour is ER positive and/or PR positive

Biological therapy (trastuzumab+/- pertuzumab) for women with HER2 positive tumours.

Radiation therapy will often be recommended if you have had breast-conserving surgery, and often after mastectomy if the armpit lymph nodes are involved.

Treatment choices for stage III breast cancer

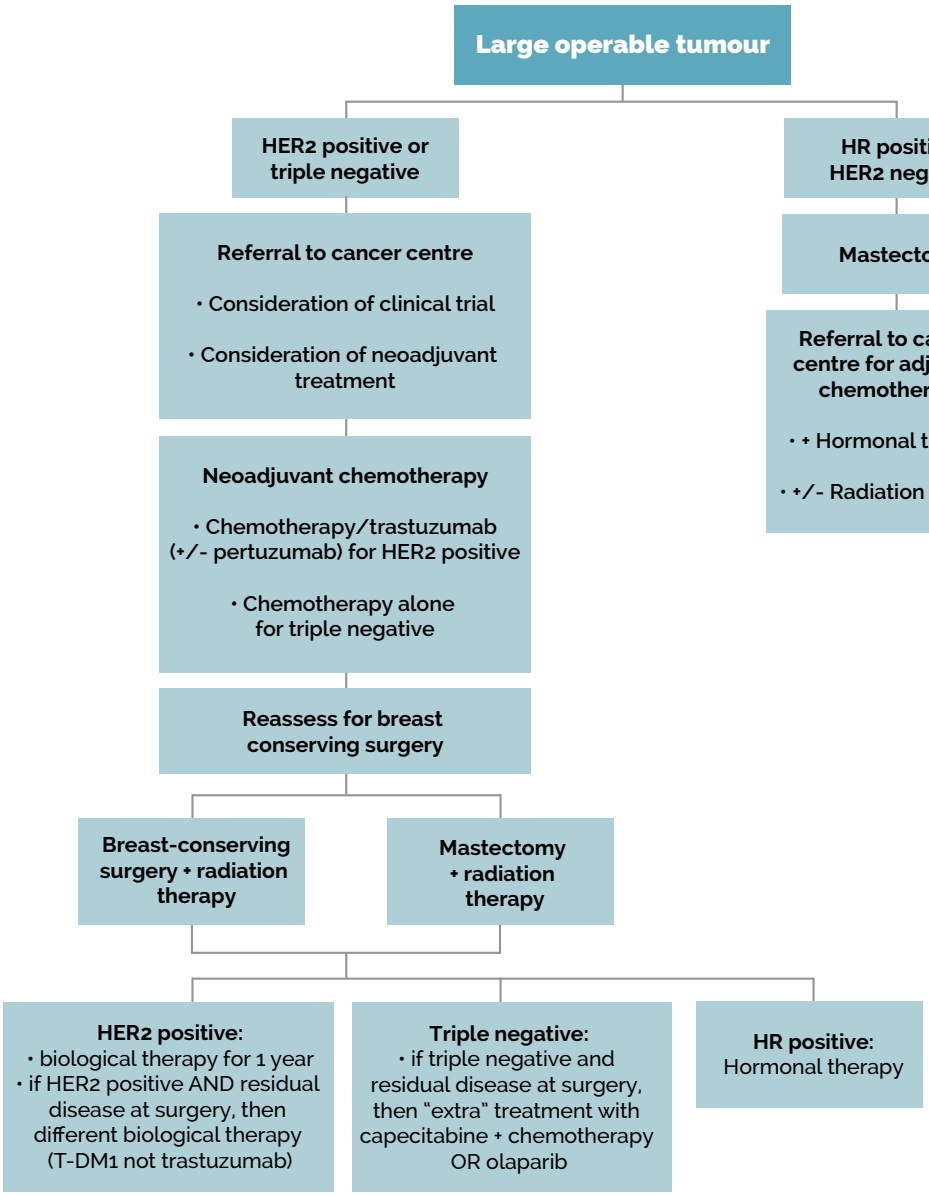
Recall that stage III cancers include a variety of tumours, which may have spread to numerous lymph nodes and/or to the chest wall or the skin. Stage III cancer is sometimes referred to as *locally advanced cancer (only stage IIIB and IIIC). Inflammatory breast cancer*, a relatively uncommon cancer, is grouped together with stage III cancers if it has not spread to other regions of the body.

If the cancer is operable—that is, if it can be completely removed surgically—you may be offered:

- A mastectomy to begin the treatment if ER positive/HER2 negative
- Alternatively, more usually, neoadjuvant chemotherapy to shrink the tumour before surgery
- After surgery, your oncologist will also recommend radiation therapy, as well as hormonal therapy (if your tumour is ER positive and/or PR positive), biological therapy (if your tumour is HER2 positive)
- Alternatively, chemotherapy

Common treatment options for stage III and IIIA breast cancer are displayed in Figure 12.

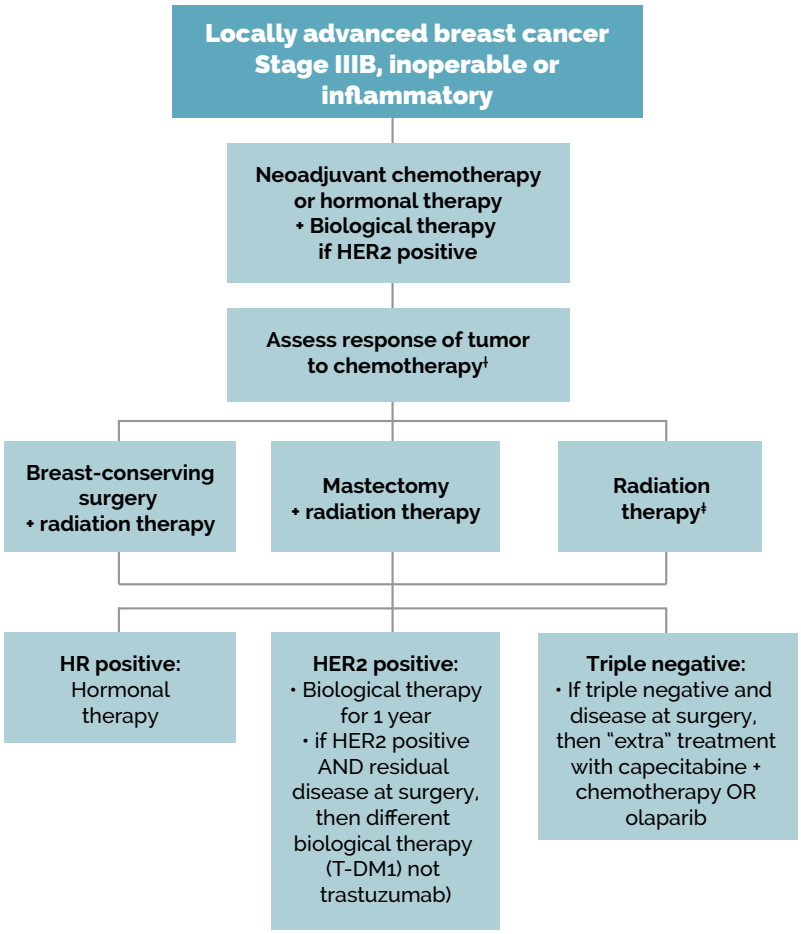
Figure 12. Common treatment options for more advanced local breast cancer (early stage III and stage IIIA)



If the cancer is inoperable—that is, if it cannot be completely removed surgically—the treatment options are somewhat different (see Figure 12).

Neoadjuvant treatment (usually chemotherapy, or possibly hormonal therapy if chemotherapy is contraindicated [172]) will likely be given first. What happens next will depend on the tumour's response—if the therapy shrinks the tumour enough, it may become operable, and you would proceed to have surgery (generally, a mastectomy) and radiation therapy. If the tumour is still inoperable, radiation may be given to shrink it to an operable size, or if not possible, to control the size of the tumour (so-called local control). Again, you will likely also be offered hormonal therapy (if your tumour is ER positive and/or PR positive) or biological therapy (if your tumour is HER2 positive).

Figure 13. Common treatment of locally advanced breast cancer (stage IIIB), inoperable or inflammatory



†Proposal of surgery is based on tumour shrinkage after chemotherapy. Patient`s choice is considered, as is whether or not surgery is an option.

‡Radiation therapy for local control of tumour if tumour does not shrink after treatment and when surgery is not an option. Medical, radiation, and surgical specialists may recommend surgery at some point.

Treatment choices for recurrent breast cancer

Sometimes, in spite of neoadjuvant or adjuvant therapies, breast cancer may recur in:

- The remaining breast tissue (if you had breast-conserving surgery) or at the mastectomy site— known as *local recurrence*
- Nearby lymph nodes in the armpit (axillary nodes), near the breastbone (internal mammary nodes), around the collarbone (supraclavicular or infraclavicular nodes), or in the skin or the chest wall— known as *locoregional recurrence*[172]
- Other organs such as the bones, liver, or lungs (distant or metastatic disease)

Local recurrences can often still be completely removed (excised) with approaches that are similar to what was used for the original tumour; however, locoregional recurrences are often more difficult to treat.

The treatment options will be based on several factors, including:

- The area involved
- The hormone receptor status of the cancer (which may be different from the hormone status of the original tumour)
- The previous treatments you have had, and the time between the original treatment and the recurrence. For example, radiation therapy usually cannot be repeated on the same area of the body, but some chemotherapy regimens can be repeated, or a different chemotherapy regimen can be chosen
- Surgery that follows a breast-conserving operation might be a second breast-conserving procedure or a mastectomy, depending on the details of your situation
- Your own preferences will play a large role in the treatment decisions you make with your oncology team

Treatment choices for metastatic breast cancer (stage IV)

Recall that metastatic (stage IV) cancer is disease that has spread beyond the general area of the breast or regional lymph nodes to other organs (e.g., bone, lung, liver, brain).

This stage of cancer cannot be cured, but its growth can often be controlled or slowed, and symptoms it causes can be managed. Various newer targeted treatments have also shown improvements in survival. Your treatment choices will be based on several factors, including your previous treatments, your symptoms and their urgency, and your own preferences.

The treatment modalities include:

- **Hormonal therapy +/- targeted therapy**: if the disease is currently hormone receptor positive
- **Chemotherapy:** if your disease is hormone receptor negative, or if it is hormone receptor positive but all the hormonal therapy options have already been used
- **Immunotherapy:** in some cases of triple negative breast cancer (given with chemo) – research ongoing
- **Biological therapy**: if the tumour is HER2 positive; trastuzumab and pertuzumab are usually started together with chemotherapy and continued until the disease progresses, and sometimes beyond
- **Radiation therapy**: to treat symptoms such as pain from metastases to the bones or the chest wall, or to control metastases to the brain, spinal cord, or lung
- **Supportive therapy**: to control pain, maintain bone health, and prevent fractures; to offer psychological help to you and your family

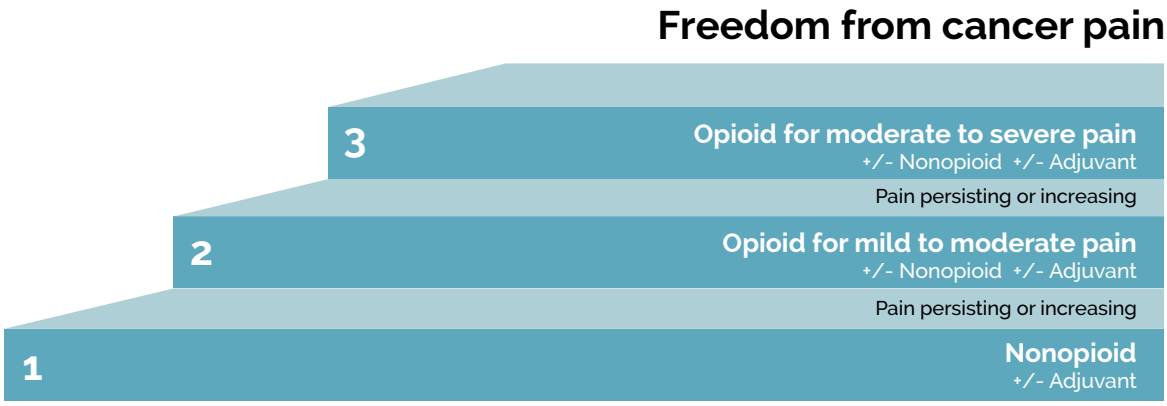
ABOUT PAIN RELIEF [173]

Many people with breast cancer fear having to face severe pain from their disease most of all. You should know that cancer pain is usually controlled very effectively, and some people may or may not experience the same severity of pain. Persistent pain in breast cancer can arise from a number of causes, including:

- Damage to nerves in the area where you had surgery
- Swelling of the arm (lymphedema) if lymph nodes were removed
- Certain chemotherapy drugs
- The spread of the cancer to pain-sensitive structures such as the bones

Nondrug methods that might sometimes help soothe the pain include applying heat or cold or using compression therapy for lymphedema, massage, relaxation therapy, and acupuncture.

Figure 14. WHO's pain relief ladder[174]



World Health Organization. WHO's pain relief ladder.

As far as painkillers are concerned, cancer pain is often managed using a stepwise "ladder" approach designed by the World Health Organization (WHO; Figure 14).[174]

- The **first step** is to use common painkilling drugs such as acetaminophen or ibuprofen.
- The **second step** involves adding codeine (or a similar drug), which is a relatively mild drug in the group called opioids (drugs that have similar structures to morphine).
- The **third step** involves using stronger opioids to control more severe pain.

These drugs may be taken in many different ways, depending on your circumstances—tablet, injection, rectal suppository, skin patch, or pump that you control yourself according to your needs.

Opioids are sometimes also called narcotics, and many patients "hold out" because they are afraid of becoming addicted to narcotics. You should know that cancer patients who take narcotics due to pain related to their disease do not become addicted to them. They take painkillers because they need them. Other patients are worried about side effects of these painkillers, such as constipation or drowsiness, but these side effects can generally also be managed.

You should not have to suffer pain because you fear addiction or side effects of painkilling medication.[175]

PALLIATIVE CARE: MORE THAN YOU MIGHT THINK [176]

For some people, in whom the cancer is extremely aggressive, presents in an advanced stage, or recurs despite a host of available therapies, the focus of care turns toward control of symptoms and improving quality of life, as well as prolonging survival.

Many people believe that palliative care (hospice care) is only for people who are terminally ill and close to dying. Not true!

- Palliative care can certainly help to make a person's passing be as peaceful as possible, **but it is also for people with breast cancer who may be much farther from death.**
- Palliative care **focuses on achieving the best possible quality of life for you** and your family while you are living with cancer.

Palliative professionals are skilled in helping you with physical symptoms such as pain, nausea, vomiting, and shortness of breath, as well as psychological symptoms such as fear, anxiety, depression, and sadness. Recent studies have suggested the earlier integration of palliative care into your treatment strategies may possibly led to better survival compared to integration at a later time point.

The team can also help you access support you need for matters such as financial burdens and for a variety of family needs, such as explaining what is going on to young children and teens. Thus, you might have a chance to benefit from palliative care at any point throughout your illness. The multidisciplinary palliative care team works closely with your oncology team at the cancer centre and will be able to connect with you at home, in a clinic, or in hospital.

CLINICAL TRIALS: WHAT ARE THEY? SHOULD I PARTICIPATE?

Today, people with breast cancer receive better, more effective treatment than ever before. However, until we have learned enough to cure breast cancer, we will need to continue to research all aspects of the disease.

A new treatment may be discovered in the laboratory, and then be tested in animals; if the results are promising, the treatment is then tested in patients (by clinical trials, also known as clinical studies).

A **clinical trial**, one of the most important research methods we have, tries to gather rigorous evidence to answer a scientific question. A tremendous range of questions can be explored such as the following:

- Is treatment A or treatment B more effective in patients with a certain stage of breast cancer?
- What is the best timing for a certain surgical procedure?
- Which method of delivering radiation therapy—method A or method B—produces fewer side effects?

Clinical trial results have taught us a great deal about which approaches are best for certain groups of people. For instance, early trial results showed that radical mastectomy did not improve survival time over less radical surgical options. After more extensive testing and many years of follow-up, the less radical surgical options have become standard therapy, yielding the best results for the most patients.

However, **one should remember that clinical trial results tell us something about the likelihood of treatment success in groups of people, not in a particular person**. Thus your physician's clinical judgment and your individual circumstances—your age, your general health, your stage, and your own preferences—are always considered together with clinical trial results.

Before a trial can begin enrolling patients, every clinical trial must submit its protocol (a detailed description of exactly how the trial will be designed and carried out, and how the data will be analyzed) for approval by both Health Canada and the research ethics board of the institution conducting the trial.

This process ensures that clinical trials are designed and conducted safely, fairly, and ethically. Before you participate in a clinical trial:

- You must be given detailed written information about the trial
- You must give informed written consent

Your participation is *always* voluntary—you will never receive poorer care if you choose not to enter a clinical trial, or if you choose to withdraw from a clinical trial at any time.[177]

Clinical trials can be designed in many different ways.

- **Placebo-controlled clinical trials** compare the effectiveness and safety of a new treatment with a look-alike treatment that has no active medicinal ingredients (the placebo). Often, a standard treatment will be given to all patients in the trial and in addition, half the patients will receive the new treatment being tested while the other half will receive a look-alike placebo.
- **Comparative clinical trials** try to compare the effectiveness and safety of two or more treatments in a group of patients whose disease has similar features (for instance, the treatments may be tested for metastatic disease or for early-stage disease).
- In **randomized trials**, neither the patient nor the researcher can choose which of the treatments in the trial to receive. Instead, the patient's treatment group is determined by statistical methods such as randomized computerized assignment. Randomized trials for breast cancer are designed such that any administered treatment would be appropriate for the patient (i.e., there would be no known disadvantage to receiving one treatment over another), and to eliminate the risk of bias favouring one treatment over another.
- In **double-blind trials**, neither the patient nor the researcher knows which of the different treatments being tested the patient is actually receiving. One way to do this is to label all pill bottles with codes instead of the name of the treatment; the codes are not revealed by the trial administrator until the study has been completed and analyzed. A trial in which patients and researchers know which treatment is being received is called an **open-label trial**.

SOME Q&A ABOUT CLINICAL TRIALS

If I participate in a clinical trial, what is in it for me?

Advantages[178, 179]

- As a clinical trial participant, you will generally be monitored in more detail than most patients who are not participating in a clinical trial. Some clinical trial patients have been followed for over 20 years.
- Follow up care will be improved due to increased access to a wider range of clinical practitioners.
- You may gain access to new (and possibly more effective) treatments for your own condition.
- Finally, you are helping to advance our understanding of breast cancer and its treatments. Your participation will lead to support for others with similar conditions.

Disadvantages

- Closer monitoring may involve more frequent medical visits, testing, interviews, and/or surveys—some people find this increased contact with the treatment team to be comforting, while others feel it is too time-consuming.
- Every treatment, even standard treatment, has risks and benefits. If a new treatment is still in the testing phase, there may not be much information about its risks (such as rare side effects) and benefits (such as effectiveness in different types of patients).
- Trial results may not be guaranteed to produce beneficial results.

Which clinical trials are accepting patients right now? How do I know which one is suitable for me?

Your opportunity to join a clinical trial depends on which trials are being conducted at centres that are accessible to you and on the characteristics of patients in those trials. For example, if you had early-stage breast cancer, you would not be able to join a clinical trial of a treatment aimed only at people with metastatic disease.

Each clinical trial sets eligibility criteria. For more information about participating in clinical trials and about which trials are currently being conducted in Canada, search online at:

www.trial-finder.ctontario.ca

www.oncoquebec.com

www.canadiancancertrials.ca

www.clinicaltrials.gov

I am thinking of going into a clinical trial, but I have been told that I cannot choose the treatment I will receive. Why is this?

The trial you are considering has a randomized design. Consider a clinical trial that has set out to compare treatment A with treatment B and let us say the researchers found that those in the treatment B group had better outcomes. If it turned out that the treatment B group also happened to have many more patients with small, early-stage, low-grade cancers, how could we be sure that the better result they noticed was due to the different treatment and not to the different features of the cancers that were treated? That is why it is important in these types of trials that patients be assigned randomly to either of the treatment groups. The researchers hope that in this way the different treatment groups will contain roughly equal numbers of patients with similar disease features.

I have been told that if I enter a particular clinical trial, the researchers, my own doctor, and I might not find out which treatment I have been on until the end of the trial. Why is this?

This trial has a double-blind design. It may be part of human nature to favour—consciously or unconsciously—one of the treatments over the other, even before the results are in. This is especially true when assessing subjective factors such as pain relief. Double-blinding helps to prevent errors that might arise from conscious or unconscious biases.

NOTES

DEALING WITH YOUR EMOTIONS

Being diagnosed with cancer is always shocking and can be overwhelming. You may find yourself on a roller coaster between feeling numb and feeling all sorts of intense emotions—panic, outrage, anger, guilt, despair, fear. Some of what you feel may surprise you or even embarrass or shock you. **You need to know that your reactions are understandable, and that help is available to get you through them.**

One of the best ways to deal with your emotions is to talk about them—to family members, friends, other patients in a support group, or members of your healthcare team. If you need additional help, your healthcare team can help you to connect with a psychiatrist, psychologist, local support group, or other therapist.

The *Canadian Cancer Society* has suggested some tips for coping with emotions:[180]

- Recognize your emotions: acknowledgment of how you feel
- Accept your emotions: you are allowed to feel your emotions
- Don't worry alone: ask for support from family or friends or your health team
- Decrease stress: participate in activities you enjoy
- Be informed: address your emotions in your follow-up appointments
- Keep up with regular follow-up appointments
- If you are overwhelmed, overburdened with your emotions and you cannot function with your daily activities, speak to your doctor

> *"Find humour in whatever way you can… I have laughed more since my diagnosis—I have two teenage girls so I teased them about their father getting a whole new wife, new hair—after my chemo and new boobs, possibly a tummy tuck in the process…all good, right! Seriously though you will have difficult times and it can be very hard throughout this journey—remember this is not a club any of us asked to join. When you are having a bad day, try to find something to lift your mood or laugh about." Jo-Anna M.*

FOLLOW-UP AFTER YOUR BREAST CANCER TREATMENT IS FINISHED

Living in remission can be an enormous relief because the tumour is gone, and you have been given another chance at life. Sometimes, the diagnosis of cancer will have changed your priorities or career directions, and you will be making important adjustments in your life because of this. However, it is important to remember that because there is some risk that the disease will recur, you need to follow your doctor's recommendations for follow-up care.

Most people who receive treatment for early-stage breast cancer will never have a recurrence. For people with stage I breast cancer, the 5-year relative survival rate is close to 100 percent. If your tumour was larger and/or you have negative prognostic factors, the risk of recurrence is higher. The greatest risk of recurrence is in the first few years after diagnosis, but the cancer could possibly recur even 10 years later or more. This is why **it is important that you receive follow-up care after your breast cancer treatment has finished.**

- If you had stage I or II breast cancer, a doctor (oncologist or family doctor) should examine you every 3 to 6 months for 5 years, and once a year after this.
- The follow-up may include a clinical breast examination (including examination of the lymph nodes in the area, the surgical site and surgical scar) as well as a mammogram.

- A mammogram will be required once a year.[181] If you had dense breasts, additional periodic ultrasounds or MRIs will be considered.
- A heart function test may be required if you had been on drugs which cause heart damage.[181]
- If your treatment included an aromatase inhibitor, a bone density scan will be required to monitor for bone weakness and/or osteoporosis.[181]
- Other health exams may include a pelvic exam, blood chemistry tests, and ultrasound are only ordered if indicated.[181]
- Your doctor will also monitor your general health and check for any long-term consequences of the disease or its treatment.

You are encouraged to report new symptoms or symptoms that have lasted for a long time to your healthcare team and not necessarily wait for a follow up appointment.

These symptoms may include new or worsening pain, unintentional weight loss, fatigue, lymphedema (swelling where lymph nodes had been removed), vaginal bleeding/spotting, shortness of breath, long-term cough, numbness in the limbs (hands, feet), or recurring headaches.[181]

WHAT ARE YOUR CONCERNS?

Cancer can affect people at any stage in their lives.

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 careers and makes it more difficult to look after others who depend on them, such as children and aging parents.

Older patients may worry about the effect of cancer on other health problems, not having enough support, or losing the opportunity to enjoy their retirement.

Each stage has its special concerns, and you might be able to find a support group specifically for cancer patients who are close in age to you and whose concerns are likely to be similar to yours.

Relationships

Cancer changes not only your life, but also the lives of those around you. You will need to decide who to tell about your diagnosis and what to say. Most of the people close to you are likely to be supportive and caring when they learn that you have cancer, and your relationships with them will grow deeper and stronger. However, other people have a difficult time dealing with their own emotional reaction to your diagnosis, and so they may respond by withdrawing from you, blaming you for having cancer, making insensitive remarks, giving you unwanted advice, and other reactions that may leave you feeling hurt or angry. It can be very helpful to have someone else to talk to in this situation.

Children

Your relationship with children may also change; they may go through many emotions and have to learn how to cope with the illness with you. Talk to your family about the possible temporary changes to their routine lives and the normal dynamics of your family. This can be accomplished by addressing how to cope with their concerns, feelings of fear, and/or feelings of abandonment.Ask your healthcare team for supportive services, like connecting with a social worker, for families coping with cancer.

Appearance and self-image

Hair loss, scarring, loss of breast tissue, weight gain or loss, and other changes in your appearance may make you feel less attractive or more self-conscious than you were before. You are not alone!

- The *Look Good Feel Better* program teaches women with cancer how to adapt makeup and skin care routines for their own needs, and how to choose a wig or a hat. To inquire about the services and materials offered by *Look Good Feel Better*, call 1-800-914-5665. Find the nearest workshop and register today: https://lgfb.ca/en/workshop/
- You might consider being fitted for a breast prosthesis (breast form) if you've had a lumpectomy or mastectomy. These days, you will be able to find everything from pretty lingerie to swimwear and sports bras to meet your needs. You can access the Canadian Cancer Society free wig and breast accessories bank. To order breast accessories, call **1-888-939-3333.**
- You might also want to consider whether breast reconstruction is an option for you. (For more about breast reconstruction, see page 62: *Reconstructive surgery after mastectomy.*)

Sexuality

Worry and stress about the diagnosis of cancer, feeling unattractive, fatigue from chemotherapy or radiation therapy, breast tenderness or numbness, and effects of hormonal therapy such as decreased desire and vaginal dryness all can take their toll on your sexual life. Again, you are not alone with your concerns. Do not be embarrassed to talk to your healthcare team about sexual concerns or problems you may be having.

Here are some sexual health tips:

- Communicate with your partner. For example, make sure your partner knows that your lack of sexual desire is based on fatigue or stress, not lack of love or respect. If you find this difficult, a professional counselor may be able to help mediate.
- For the time being, touching and cuddling may be easier ways to give and receive pleasure and comfort rather than sexual intercourse. Again, communicate with your partner about what pleases you both.
- To lessen pain during sex, try the following:
  - Use a water-based lubricant if your vagina is dry; allow additional time to get aroused.
  - Avoid estrogen creams unless approved by your healthcare team
  - Try positions that do not put pressure on your arm or chest if they are painful; use pillows for support
  - Take a mild pain-relieving medication before sexual intercourse

NOTES

LEARNING MORE AND SEEKING SUPPORT

When you are diagnosed with breast cancer, you may seek information to help with making decisions. If you cannot remember much of what your doctor said when you were given your diagnosis, you may want to make another appointment with your physician to learn more about your disease and to discuss treatment options. Writing out your questions before the appointment, taking a family member with you, and making notes can help you get the information you need.

Numerous other sources of information are also available, including other patients, books, online resources, and other members of your healthcare team. Patients who have more information generally do better because they feel more confident and are more able to participate in their treatment.

FINDING A SUPPORT GROUP

If you are interested in talking to, and learning from people who have had similar experiences, ask your oncologist, your cancer nurse, or the oncology social worker if they know of any groups in your area. You can also find a support group by calling the Canadian Cancer Society's Community Services Locator at 1-888-939-3333. The Community Services Locator maintains a national database of support groups listed by postal code but does not rate them. You will have to use your own judgment to find a group that appeals to you.

FINDING RESOURCES

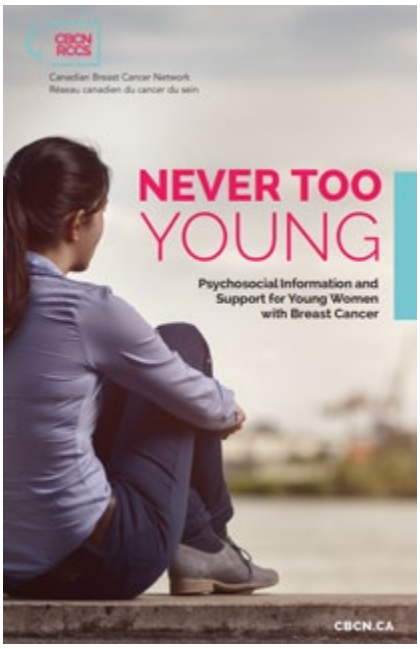
Some important things to remember when you are reading about your disease or about coping with cancer:

- Make sure the treatment information you are reading is current. Much of what is published may already be outdated because cure rates, survival statistics, and treatments can change.
- Find an author whose writing makes sense to you. All authors try to write clearly, but writing styles, terminology, and approaches to discussing cancer vary from author to author.
- You do not need to spend money buying books unless you want to. You can borrow books from a support group or from your local library. Some book resources can be ordered online through breast cancer organizations such as CBCN.
- Evaluate the credibility of any publication you find. Books may be inaccurate or out of date. Although authors try to give you accurate information, some may be biased or misinformed.
- There are many credible online resources from cancer organizations, which provide online and text resources. The cancer center where you attend will also have many resources in print or websites that will provide breast cancer information.

Additional CBCN resources

Books

Metastatic Breast Cancer (mBC) Handbook:
A guide for individuals living with **stage IV** breast cancer
www.cbcn.ca/mbc-newly-diagnosed-guide



Never Too Young: Psychosocial Information and Support for YOUNG WOMEN with Breast Cancer
www.cbcn.ca/never_too_young

View these resources online at cbcn.ca or order a copy at www.cbcn.ca/order-our-resources.

Digital Resources

Our Voices Blog
www.cbcn.ca/share-your-story

SurgeryGuide: Helping you understand your surgical options
www.cbcn.ca/surgeryguide

FinancialNavigator: Your path to accessing financial resources
www.cbcn.ca/financialnavigator

MedSearch: What breast cancer drugs are available in Canada
www.cbcn.ca/medsearch

Using the internet

The internet has thousands of websites devoted to cancer. Websites can provide huge amounts of information about treatment, alternative medicine, personal experiences, specific types of cancer, and general cancer issues. It is important to note, however, that information on the internet is not screened for accuracy, so be sure to assess the credibility of information you find there.

Canadian resources

Canadian Breast Cancer Network
CBCN exists to ensure that patients are supported through information, education and advocacy. Our aim is to ensure that all Canadians diagnosed with breast cancer have access to the best care, regardless of where they live in Canada.
www.cbcn.ca

Canadian Cancer Society
The Canadian Cancer Society's mission is to continuously improve impact through cancer research, advocacy, and support services. The Canadian Cancer Society's Community Services Locator is a directory that helps cancer patients, caregivers and healthcare providers find the services they need.
www.cancer.ca

Cancer Chat Canada
Cancer Chat provides free, professionally led online support groups for Canadians affected by cancer, including patients, survivors and family members. Support groups are structured to provide emotional support and a place to safely discuss personal topics.
www.cancerchat.desouzainstitute.com/

Fertile Future
Fertile Future is a Canadian national non-profit organization that provides fertility preservation information and support services to cancer patients and oncology professionals.
www.fertilefuture.ca

MyPathologyReport.ca
MyPathologyReport.ca is a freely accessible medical education tool created by doctors to help you read and understand your pathology report.
www.mypathologyreport.ca

Quebec Breast Cancer Foundation
The Quebec Breast Cancer Foundation is dedicated to making investments for the benefit of the province's breast cancer patients and its scientific and medical community.
www.rubanrose.org

Rethink Breast Cancer
Rethink's mission is to empower young people worldwide who are concerned about and affected by breast cancer through innovative education support and advocacy.
www.rethinkbreastcancer.com

Wellspring
Wellspring is a Canada-wide network of community-based centres, each offering programs and services, at no charge and without referral, to anyone, with any type of cancer, at any stage in their journey.
www.wellspring.ca

Young Adult Cancer Canada (YACC)
Young Adult Cancer Canada supports young adults living with, through and beyond cancer. www.youngadultcancer.ca

Other resources

Breastcancer.org
Breastcancer.org's mission is to help people make sense of the complex medical and personal information about breast health and breast cancer, so they can make the best decisions for their lives.
www.breastcancer.org

Living Beyond Breast Cancer
LBBC provides programs and services to help people whose lives have been impacted by breast cancer. Their goal is to provide information, community, and support that you can trust, is easy for you to access, and respectful of you and your situation.
www.lbbc.org

Metastatic Breast Cancer Network
MBCN is a national, patient-led organization that works to raise awareness of metastatic breast cancer within the breast cancer community and public. MBCN encourages women and men living with the disease to raise their voices to demand support, resources, and more research for metastatic disease.
www.mbcn.org

National Cancer Institute (NCI, USA)
The National Cancer Institute is the United States federal government's principal agency for cancer research and training. To find breast cancer related information, navigate to "cancer types", then "breast cancer" then "breast cancer treatment" links.
www.cancer.gov

Stupid Cancer
Stupid Cancer helps empower young patients with cancer, providing age-appropriate resources to help navigate treatment and survivorship.
www.stupidcancer.org

NOTES

GLOSSARY OF FREQUENTLY USED TERMS

adjuvant therapy: additional treatment (usually after surgery) whose goal is to remove any individual cells (microscopic traces of disease) that may be left behind

alopecia: hair loss, often associated with chemotherapy

anastrozole: an aromatase inhibitor drug that prevents the adrenal glands and other tissues from producing estrogen; used to treat hormone receptor–positive breast cancer in postmenopausal women; brand name Arimidex®

anemia: a reduction in hemoglobin (a measure of the red blood cell count) to below normal levels; chemotherapy or the disease itself may cause anemia

antibody: a substance used in treatments directed against an antigen (below). Examples are trastuzumab (Herceptin®) and bevacizumab (Avastin®). The antibody is made to fit into the antigen like a key into a lock, with exact precision. Many of these treatments have fewer side effects than traditional chemotherapy because they are specific to the targeted antigen

antigen: a unique identifying structure found on the surface of all cells and organisms that allows the immune system to determine whether the cell is foreign to the body

Anzemet®: see dolasetron mesylate

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

Aranesp®: see darbepoetin alfa

Aredia®: see bisphosphonates

Arimidex®: see anastrozole

Aromasin®: see exemestane

aromatase inhibitors: hormonal therapies. In postmenopausal women, the ovaries do not produce estrogen; rather, it is produced by conversion of androgen to estrogen in fat and muscle cells. The androgen can be converted to estrogen only by a reaction involving an enzyme called aromatase.

The drugs anastrozole, letrozole, and exemestane block aromatase and decrease circulating estrogen to almost zero, thus starving the cancer cells of estrogen, which is required for growth

Avastin®: see bevacizumab

axillary lymph nodes: glands in the armpit that are part of the body's defense against infection. These are the nodes most likely to contain cancer cells that have spread from the breast.

axillary node dissection: the surgical removal of lymph nodes in the armpit (axilla), usually in patients with breast cancer that has spread to the lymph nodes. Often preceded by sentinel lymph node dissection (see sentinel node dissection)

benign growth: a noncancerous lump or growth

bevacizumab: a drug that fights cancer by stopping the growth of blood vessels in tumours; brand name, Avastin® (approved in North America for the treatment of colorectal cancer)

biopsy: removal of tissue sample for examination. Biopsies are sometimes done with a fine needle or slightly larger core biopsy and local anesthetic, or they can be taken during surgery

bisphosphonates: bone-strengthening drugs used in the treatment of metastatic cancer in bones; it can also reduce the number of metastatic tumours in bones; drugs include clodronate (Bonefos®, Ostac®), pamidronate (Aredia®), and zoledronic acid (Zometa®)

Bonefos®: see bisphosphonates

breast-conserving surgery: a type of surgery that removes the tumour and some healthy surrounding tissue, but leaves much of the breast intact

carcinoma in situ: ductal carcinoma in situ (DCIS) and lobular carcinoma in situ (LCIS) are both noninvasive, or non-spreading, tumours. They are sometimes referred to as precancer

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

chemotherapy regimen: a particular combination, dose, and schedule of cancer-fighting drugs that work by interfering with cell division. There are many possible chemotherapy regimens in use for breast cancer, each with their advantages and disadvantages

clinical trial: a study in which a new treatment idea (a drug, procedure, radiation method, etc.) is systematically studied in patients. Clinical studies often follow testing in the laboratory and in animals (preclinical studies)

clodronate: see bisphosphonates

complete response (complete remission): when therapy has eradicated all signs of disease

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

core biopsy: a needle biopsy using a large hollow needle to remove a core of tissue from a tumour

CT scan: see computed tomography

cure: cure is more than remission. It means that all signs of the disease have been eradicated (you are in remission) AND there is no (very little) chance that your disease will recur. Note: doctors are usually reluctant to think in terms of a cure in breast cancer until you have remained disease-free for several years

cycle: one course of a fixed dose of a chemotherapy drug or combination of drugs, usually with a defined schedule over a predetermined period of time, such as 3 or 4 weeks

cyst: a fluid-filled sac, usually benign

cystitis: inflammation of the bladder

darbepoetin alfa: a manufactured biological response modifier similar to erythropoietin, a natural hematopoietic growth factor in your body that stimulates the production of red blood cells; used to treat anemia (low red blood cell count) after chemotherapy; a modified version of recombinant human erythropoietin that stays in the body longer and can therefore be administered less frequently; brand name Aranesp®

Decadron®: see dexamethasone

denosumab: a biological therapy that counters a receptor in bone tissue that would usually stimulate cells that break down bone tissue (resorption). Given as an injection under the skin twice a year (Prolia®), this drug works to treat osteoporosis and reduces the risk of bone fractures in postmenopausal women with osteoporosis. When given as an injection every 4 weeks (Xgeva®), this drug is used to treat patients with cancer that has spread to the bones, to prevent or delay cancer-related complications like broken bones and/or bone pain that need surgery or radiation

dexamethasone: an anti-nausea medication; brand name Decadron®

dimenhydrinate: an anti-nausea medication used for nausea occurring more than 48 hours after chemotherapy; brand name Gravol®

direct extension: spread of the tumour into the surrounding tissues of the breast, chest wall, or nearby lymph nodes

disease progression (treatment failure): the disease has worsened, or the tumour has grown during therapy

docetaxel: a synthetic derivative of the European yew, used to treat breast cancer and non–small-cell lung carcinoma; brand name Taxotere®

dolasetron mesylate: an anti-nausea medication; brand name Anzemet®

domperidone: an anti-nausea medication used for nausea occurring more than 48 hours after chemotherapy; brand name Motilium®

dose escalation: increasing the dose of a drug to intensify the therapeutic effect

drug resistance: the ability of some tumours to develop immunity to one or more chemotherapy drugs

ductal carcinoma in situ (DCIS): see intraductal carcinoma

durable response (remission): a remission that is long-lasting

epoetin alfa: a manufactured biological response modifier that mimics erythropoietin, a natural hematopoietic growth factor in your body which stimulates the production of red blood cells; used to treat anemia (low red blood cell count) after chemotherapy; brand name Eprex®

Eprex®: see epoetin alfa

ER positive: see hormone receptors

erythropoietin: the body "manufactures" its own blood, and erythropoietin is involved in this process as a hematopoietic growth factor in the production of blood. Specifically, erythropoietin stimulates the development of red blood cells from immature cells. Recombinant human erythropoietin (epoetin alfa) has been manufactured under the brand name Eprex®

Evista®: see raloxifene

exemestane: an aromatase inhibitor drug that prevents the adrenal glands and other tissues from producing estrogen; used to treat hormone receptor–positive breast cancer in postmenopausal women; brand name Aromasin®

experimental therapy: see standard therapies

Femara®: see letrozole

filgrastim: a manufactured hematopoietic growth factor that stimulates the development and differentiation of neutrophils from stem cells; also known as granulocyte colony–stimulating factor (G-CSF); brand name Neupogen®

fraction: a dose of radiation used in radiation therapy

G-CSF: see granulocyte colony–stimulating factor

gene: a segment of material inherited from your parents—a section of DNA—that specifies the manufacture of a particular product, often a protein

goserelin: a luteinizing hormone–releasing hormone agonist drug used to reduce the production of estrogen by reducing the pituitary gland's signal to the ovaries to make estrogen; brand name Zoladex®

granisetron: an anti-nausea medication; brand name, Kytril®

granulocyte colony–stimulating factor (G-CSF): a hematopoietic growth factor made in the body that stimulates the development of neutrophils from stem cells, and that has also been manufactured for therapeutic use

Gravol®: see dimenhydrinate

growth factor support: giving manufactured hematopoietic growth factors filgrastim or pegfilgrastim after chemotherapy to help the neutrophil count recover more rapidly; brand names Neupogen® and Neulasta®

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

HER2: human epidermal growth factor receptor 2—part of the epidermal growth factor receptor (EGFR) family; a gene inside the cell that controls production of the cell's growth factor receptor; high levels of HER2 on breast cancer cells may suggest that the tumour is more likely to recur or spread

Herceptin®: see trastuzumab

hormone receptors: cell structures to which hormones attach themselves, and so affect the behaviour of that cell. Some types of cancer cells have receptors for the hormones estrogen (ER positive) or progesterone (PR positive), and will often respond to hormonal therapy

hormonal therapy: cancer therapy that prevents natural hormones from causing the growth of tumour cells

immune response: the normal response of the immune system to protect the body from foreign substances

immune system: the body system responsible for maintaining health by removing abnormal cells and fighting infection

immunologic treatment: a group of investigational treatments attempting to stimulate the body's defense (i.e., immune) system to attack cancer cells more effectively; also called immunotherapy

in situ: Latin for "in its original position"; cancer that has not spread beyond where it began; noninvasive

inflammatory carcinoma: an uncommon, rapidly growing type of breast cancer that is characterized by redness and swelling in the breast resembling an infection

intraductal carcinoma: breast cancer that began in the milk ducts and has not spread beyond the ducts; also called ductal carcinoma in situ

investigational therapy: see standard therapies

Kytril®: see granisetron

letrozole: an aromatase inhibitor drug that prevents the adrenal glands and other tissues from producing estrogen; used to treat hormone receptor–positive breast cancer in postmenopausal women; brand name Femara®

leuprolide: a luteinizing hormone–releasing hormone agonist drug used to reduce the production of estrogen by reducing the pituitary gland's signal to the ovaries to make estrogen; brand name Lupron Depot®

lobular carcinoma in situ (LCIS): cancer that began in the lobules of the breast and has not spread beyond the lobules

lobule: a grouping of milk glands in the breast, leading to milk ducts

local treatment: any treatment that targets a specific area of the body (e.g., breast, lymph nodes, or lungs) instead of the entire body. Local treatments for breast cancer include surgery and radiation. You may also hear the term "regional treatment" of lymph nodes because they are located in the region surrounding the breast

lumpectomy: a type of breast-conserving surgery in which the breast lump and a small margin of normal breast tissue are removed

Lupron Depot®: see leuprolide

lymph channel: a network of vessels connecting lymph nodes

lymph glands: see lymph nodes

lymph nodes: glands that are part of the body's system of defense against infection

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

malignant growth: a tumour that can spread somewhere else in the body; cancer

mammogram: see mammography

mammography: an imaging technique using low-dose X-rays to get a better look at changes found in the breast during physical examination, or to check the breast even when no obvious changes have been discovered; the resulting image is called a mammogram

mastectomy: removal of the whole breast

Maxeran®: see metoclopramide

medical oncologist: a cancer physician specializing in the use of drugs (chemotherapy or hormones) to treat cancer

menopause: the natural process that comes with age and marks the end of a woman's child-bearing years, when a woman's ovaries stop functioning and her menstrual periods stop. Women are premenopausal if they have regular periods and postmenopausal after their periods have stopped. Perimenopause is the few years before, during, and after menopause. The point when a woman's periods actually stop is called the climacteric. If a woman has had a hysterectomy and has no menopausal symptoms (like hot flashes), blood tests can be done to see if she is premenopausal or postmenopausal

metastasis: spread of the tumour through lymphatic channels or through the blood to areas farther away from the original tumour (e.g., bones, liver, or brain)

metoclopramide: an anti-nausea medication used for nausea occurring more than 48 hours after chemotherapy; brand names, Maxeran® and Reglan®

Motilium®: see domperidone

mutation: a genetic change in a cell; it can be spontaneous or induced by exposure to toxins, carcinogens, or radiation

neoadjuvant therapy: any treatment given before the primary modality. For example, you may receive neoadjuvant radiation chemotherapy or hormonal therapy to help shrink your tumour before having surgery

Neulasta®: see pegfilgrastim

Neupogen®: see filgrastim

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

node-negative, node-positive: breast cancer is classified as node-negative if it has not spread to the lymph nodes, and node-positive if it has

Nolvadex®: see tamoxifen

nuclear grade: see tumour grade

ondansetron: an anti-nausea medication; brand name Zofran®

Ostac®: see bisphosphonates

osteoporosis: thinning of the bone structure, caused by lack of estrogen. Women with osteoporosis are more prone to having broken bones, especially hip bones and vertebrae (bones of the spinal column). Menopause, aromatase inhibitors, and chemotherapy all decrease the estrogen in a woman's body and therefore may increase the risk of osteoporosis

ovarian ablation: using surgery or radiation to stop or impair the production of estrogen by the ovaries; formerly used to treat hormone receptor–positive cancer in premenopausal women

paclitaxel: a drug developed from the toxin of specific types of yew trees and bushes and used to kill dividing cells, especially tumour cells; brand name Taxol®

Paget's disease: a rare form of breast cancer that involves the nipple and areola, causing itchy, scaly skin; diagnosed by the presence of Paget's cells

palliative therapy: therapy whose goal is not to cure the disease but to relieve symptoms and improve your comfort. If you have had multiple relapses and your disease is not curable with standard therapy, you may be a candidate for palliative therapy. Palliative therapies may include chemotherapy, radiotherapy, and pain relief

pamidronate: see bisphosphonates

partial response (remission): when therapy has shrunk the tumour by at least 50 percent

pathologist: a physician who diagnoses disease by studying tissues removed by biopsy or surgery

pegfilgrastim: a manufactured hematopoietic growth factor that stimulates the development and differentiation of neutrophils from stem cells; also known as granulocyte colony–stimulating factor (G-CSF); a modified version of filgrastim that stays in the body longer so only one injection after chemotherapy is needed; brand name Neulasta®

perimenopause: see menopause

placebo: used in clinical trials, a look-alike treatment that actually has no therapeutic value, but is used in clinical trials as a basis to compare the effects of the treatment that is being tested. Sometimes wrongly called a sugar pill (although it may not contain any sugar whatsoever)

platelets: blood cells responsible for preventing bleeding and for stopping bleeding after any injury

positron emission tomography (PET): an imaging technique in which short-lived radioactive tracers are injected to produce images of the body's biological functions

postmenopausal: see menopause

predictive factors: the special factors found in a tumour that suggest how it might react to specific types of anti-cancer treatments

premenopausal: see menopause

primary (first-line) therapy: the first breast cancer treatment you have after your diagnosis

prochlorperazine: an anti-nausea medication used for nausea occurring more than 48 hours after chemotherapy; brand name Stemetil®

prognosis: a forecast or prediction of the likely course of a disease or outcome of treatment, based on specific aspects of the disease seen in an individual. Often expressed as the risk of relapse

prognostic factors: patient or tumour characteristics that affect the risk of spread or recurrence of the tumour

Prolia®: see denosumab

prophylactic mastectomy: removal of a breast with no known cancer in it; considered for women who are at a high risk of developing cancer

prosthesis: an artificial breast replacement

PR positive: see hormone receptors

quadrantectomy: a type of breast-conserving surgery in which about a quarter of the breast is removed

radiation oncologist: a cancer physician specializing in the use of radiation to treat cancer

radiation therapy (radiotherapy): a local treatment that works by using high-energy rays to damage the DNA of cancer cells so that they are unable to grow and divide, and eventually die

radical mastectomy: a drastic surgery, no longer performed today, that involved removing the entire breast, skin, muscles in the chest wall, and lymph nodes in the armpit

raloxifene: a selective estrogen receptor modulator; brand name Evista®

recurrence (relapse): the return of disease after you have been in complete remission

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

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

Reglan®: see metoclopramide

relapse: see recurrence

remission: see complete response, partial response, durable response

salvage therapy: a second (or second-line) therapy that is used if you have had a recurrence (relapse), or if your response to your first-line therapy was partial remission, stable disease, or disease progression. If you have relapsed after first-line therapy, second-line therapy often succeeds in bringing you into a second remission

segmental (partial) mastectomy: a type of breast-conserving surgery in which a section of the breast is removed, but not the whole breast

sentinel lymph node dissection: a preliminary removal of a lymph node (sentinel) to confirm whether cancer has spread to the lymph nodes. If the sentinel nodes contain cancer, the surgeon will probably continue to an axillary node dissection. If the sentinel nodes do not contain cancer, the axillary node dissection may not be necessary

sentinel node biopsy: surgery in which the first lymph nodes a tumour drains into are removed and examined for cancer. They are found after injecting dye into the breast

simulation session: a planning session before the start of radiation therapy. During the simulation session, the radiation therapy team uses images or scans to study the part of the body that will receive radiation and carefully calculates the exact path of the radiation beams

stable response: when the disease remains unchanged after therapy. This could mean that therapy has not affected the disease, or that it has successfully arrested the progress of the disease

staging: a system for looking at a tumour to determine its extent, risk of spread or recurrence, and appropriate treatment choices

standard therapies: treatments that have been thoroughly tested and used effectively for years. In breast cancer, numerous treatment options are considered standard. If you have not responded to standard therapy, or if your chances of response to a standard therapy are low, you may be offered an investigational (experimental) primary therapy instead

stem cells: immature cells, found in bone marrow and blood, that eventually produce red blood cells, white blood cells, and platelets

Stemetil®: see prochlorperazine

surgical oncologist: physician specializing in the use of surgery to treat cancer

systemic disease: a disease affecting the whole body

systemic therapy: therapy that targets the whole body (e.g., chemotherapy and hormonal and biological therapies). Systemic therapies aim to eliminate any cancer cells that may have spread from the breast to other parts of the body

tamoxifen: a hormonal therapy (a selective estrogen receptor modulator [SERM]) that has been effective in preventing breast cancer in women at high risk; brand name Nolvadex®

Taxol®: a trademark used for the drug paclitaxel, a drug developed from the toxin of specific types of yew trees and bushes and used to kill dividing cells, especially tumour cells

Taxotere®: a trademark used for the drug docetaxel, derived from the needles of the European yew, used to treat breast cancer and non-small-cell lung carcinoma

treatment: therapy

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

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

trastuzumab: a biological drug used in treating women with breast cancer who have high levels of HER2; brand name Herceptin®

tumour grade: a score assigned to a tumour by a pathologist representing how aggressive a tumour is in terms of risk to a patient. Nuclear grade is a contributing factor to the tumour grade, specifically measuring a tumour's degree of abnormality and how quickly it is growing

tumour node metastasis (TNM) system: a cancer staging system used mostly for research and statistical purposes; it considers tumour size (T), lymph node involvement (N), and metastases (M)

ultrasonography: a diagnostic technique using sound waves to view different parts of the body, especially internal organs

ultrasound: see ultrasonography

vascular invasion: cancer that has spread to lymph or blood vessels near the original site of the disease

Xgeva®: see denosumab

Zofran®: see ondansetron

Zoladex®: see goserelin

zoledronic acid: see bisphosphonates

Zometa®: see zoledronic acid

NAME THAT MEDICATION

Nausea and vomiting

Generic	Brand
Ondansetron	Zofran®
Granisetron	Kytril®
Dolasetron mesylate	Anzemet®
Dexamethasone	Decadron®
Prochlorperazine	Stemetil®
Domperidone	Motilium®
Dimenhydrinate	Gravol®
Metoclopramide	Maxeran®, Reglan®
Mesna	Uromitexan®
Aprepitant	Emend®

Neutropenia (low white cell count)

Generic	Brand
Filgrastim or Gastrofil	Neupogen®
Pegfilgrastim	Neulasta®

Anemia

Generic	Brand
Epoetin alfa	Eprex®
Darbepoetin alfa	Aranesp®

Targeted therapies

Breast cancer type	Drug[144]
HER2	Trastuzamab (Herceptin®) Lapatinib (Tylerb®) Pertuzumab (Perjeta®) Trastuzumab emtansine (Kadcyla®) Neratinib (Nerlynx®) Tucatinib (Tukysa®)
HR	Abemaciclib (Verzenio®) Palbociclib (Ibrance®) Ribociclib (Kisqali®)
BRCA	Olaparib (Lynparza®)

Osteoporosis

Generic	Brand
Alendronate	Fosamax®
Risedronate	Actonel®
Etidronate	Didrocal®, Didronel®
Clodronate	Bonefos®, Ostac®
Zoledronic acid	Zometa®, Aclasta®
Denosumab	Prolia®, Xgeva®
Teriparatide	Forteo®
Raloxifene	Evista®
Hormone therapy	

REFERENCES

1. University of Maryland Medical Center. Breast cancer—Prognosis. Available at: http://www.umm. edu/patiented/articles/how_serious_breast_cancer_000006_6.htm. Accessed August 21, 2011.
2. Carson-DeWitt R. About.com: Will my breast cancer return? Available at: http://breastcancer.about. com/lw/Health-Medicine/Conditions-and-diseases/Will-My-Breast-Cancer-Return-.htm?p=1. Accessed August 22, 2011.
3. Canadian Cancer Society. The Lymphatic system of the breast. Available at: https://cancer.ca/en/cancer-information/cancer-types/breast/what-is-breast-cancer/the-breasts
4. National Cancer Institute. Sentinel lymph node biopsy (Fact sheet). Reviewed April 27, 2005. Available at: http://www.cancer.gov/cancertopics/factsheet/therapy/sentinel-node-biopsy. Accessed November 23, 2010.
5. American Cancer Society. Do we know what causes breast cancer? Detailed guide: Breast cancer. Reviewed September 9, 2009. Available at: http://nccu.cancer.org/docroot/CRI/content/CRI_2_4_2X_ Do_we_know_what_causes_breast_cancer_5.asp?sitearea= . Accessed November 23, 2010.
6. Collishaw N, Boyd N, Cantor K, et al. (April 2009). Canadian Expert Panel on Tobacco Smoke and Breast Cancer Risk. Toronto, Canada: Ontario Tobacco Research Unit, OTRU Special Report Series.
7. Canadian Cancer Encyclopedia. Nutrition and breast cancer. Breast/Supportive care. Available at: http://info.cancer.ca/cce-ecc/default.aspx?lf=diet&page=2&cceid=3779. Accessed September 23, 2011.
8. Canadian Cancer Society. Risk factors for breast cancer. Available at: https://cancer.ca/en/cancer-information/cancer-types/breast/risks
9. Canadian Cancer Society. Cancer myths. (March 1, 2010.) Available at: http://sic.cancer.ca/Canada- wide/About%20cancer/Cancer%20myths.aspx?sc_lang=en. Accessed November 23, 2010.
10. Ginsburg O, Fischer H, Shah B, et al (2015). A population-based study of ethnicity and breast cancer stage at diagnosis in Ontario. Current oncology (Toronto, Ontario), 22(2), 97–104. https://doi.org/10.3747/co.22.2359.
11. Susan G. Komen. Race and ethnicity. Available at: https://www.komen.org/breast-cancer/risk-factor/race-ethnicity/. Accessed March 30, 2021.
12. Breastcancer.org. Race/ethnicity. Available at: https://www.breastcancer.org/risk/risk-factors/race-ethnicity. Accessed March 30, 2021.
13. Chlebowski R, Zhao C, Adams-Campbell L, et al (2005). Ethnicity and breast cancer: Factors influencing differences in incidence and outcome. JNCI : Journal of the National Cancer Institute, 97(6), 439–448. https://doi.org/10.1093/jnci/dji064.
14. Ooi S, Martinez M, Li C (2011). Disparities in breast cancer characteristics and outcomes by race/ethnicity. Breast Cancer Research and Treatment, 127(3), 729–738. https://doi.org/10.1007/s10549-010-1191-6.
15. Breastcancer.org. Ashkenazi Jewish women who know they have BRCA mutation have better breast cancer outcomes. Available at: https://www.breastcancer.org/research-news/ashkenazi-brca-status-and-bc-outcomes. Accessed March 30, 2021.
16. Mozersky J (2012). Who's to blame? Accounts of genetic responsibility and blame among Ashkenazi Jewish women at risk of BRCA breast cancer. Sociology of Health & Illness, 34(5), 776–790. https://doi.org/10.1111/j.1467-9566.2011.01427.x.
17. Canadian Cancer Society. Cancer myths. (March 1, 2010.) Available at: http://sic.cancer.ca/Canada- wide/About%20cancer/Cancer%20myths.aspx?sc_lang=en. Accessed November 23, 2010.
18. .Canadian Cancer Society. Do antiperspirants cause breast cancer? Available at: https://www.cancer.ca/en/prevention-and-screening/reduce-cancer-risk/make-informed-decisions/myths-and-controversies/antiperspirants-parabens/?region=ab. Accessed January 20, 2021.

19. National Cancer Institute. Antiperspirants/Deodorants and breast cancer. Available at: https://www.cancer.gov/about-cancer/causes-prevention/risk/myths/antiperspirants-fact-sheet. Accessed January 20, 2021.

20. National Cancer Institute. If no one in my family has had cancer, does that mean I'm risk-free? Available at: https://www.cancer.gov/about-cancer/causes-prevention/risk/myths. Accessed January 22, 2021.

21. Canadian Cancer Society. Canadian cancer statistics 2011. Available at: http://www.cancer.ca/ Canada-wide/About%20cancer/Cancer%20statistics.aspx?sc_lang=en. Accessed August 17, 2011.

22. Canadian Cancer Society. The benefits and risks of hormonal birth control. Available at: https://www.cancer.ca/en/prevention-and-screening/reduce-cancer-risk/make-informed-decisions/understand-hormones/benefits-and-risks-of-birth-control/?region=ab. Accessed January 22, 2021.

23. Cleveland Clinic. Non-controllable risk factors for breast cancer. Available at: https://my.clevelandclinic.org/health/diseases/3986-breast-cancer. Accessed January 22, 2021.

24. Canadian Cancer Society. Family history of breast and other cancers. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/risks/?region=ab. Accessed January 22, 2021.

25. Canadian Cancer Society. Breast cancer in men. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/breast-cancer/breast-cancer-in-men/?region=ab. Accessed April 5, 2021.

26. National Cancer Institute. After a breast cancer diagnosis, men may be more likely to die than women. Available at: https://www.cancer.gov/news-events/cancer-currents-blog/2019/male-breast-cancer-higher-mortality. Accessed April 5, 2021.

27. John Hopkins Medicine. About breast cancer in men. Available at: https://www.hopkinsmedicine.org/health/conditions-and-diseases/breast-cancer/about-breast-cancer-in-men. Accessed April 5, 2021.

28. Canadian Cancer Society. When should I be screened for breast cancer? Available at: https://www.cancer.ca/en/prevention-and-screening/reduce-cancer-risk/find-cancer-early/get-screened-for-breast-cancer/when-should-i-be-screened-for-breast-cancer/?region=ab. Accessed January 25, 2021.

29. Saslow D, Hannan J, Osuch J, et al. (2004). Clinical breast examination: practical recommendations for optimizing performance and reporting. Cancer 54:327-344.

30. Canadian Cancer Society. Clinical breast exam (CBE). Available at: https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/tests-and-procedures/clinical-breast-exam/?region=ab. Accessed January 22, 2021.

31. Breastcancer.org. Breast self-exam. Available at: https://www.breastcancer.org/symptoms/testing/types/self_exam. Accessed January 22,2021.

32. Canadian Cancer Society. Breast cancer. Available at: http://www.cancer.ca/Canada-wide/Prevention/Getting%20checked/Breast%20cancer%20NEW.aspx?sc_lang=en. Accessed August 1, 2011.

33. Canadian Cancer Society. Mammography. Available at: https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/tests-and-procedures/mammography/?region=ab. Accessed February 20,2021.

34. Densebreast-info.org. Mammography-3D-mammography-tomosynthesis. Available at: https://densebreast-info.org/screening-technologies/mammography-3d-mammography-tomosynthesis/. Accessed February 20, 2021.

35. Breastcancer.org. Digital tomosynthesis. Available at: https://www.breastcancer.org/symptoms/testing/types/dig_tomosynth. Accessed September 9, 2021.

36. Breastcancer.org. Why can't I wear deodorant to my mammogram? Available at: https://www.breastcancer.org/symptoms/testing/types/mammograms/deodorant. Accessed February 22,2021.

37. National Cancer Institute. Mammograms. Available at: http://www.cancer.gov/cancertopics/ factsheet/detection/mammograms. Accessed August 17, 2011.

38. Centers for disease control and prevention. What does it mean to have dense breasts? Available at: https://www.cdc.gov/cancer/breast/basic_info/dense-breasts.htm. Accessed February 25, 2021.

39. Canadian Cancer Society. Breast density. Available at: https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/tests-and-procedures/mammography/breast-density/?region=ab. Accessed February 21, 2021.

40. Dense Breasts Canada. Breast density classifications. Available at: www.densebreastscanada.ca. Accessed July 14, 2021.

41. American Cancer Society. Recognizing barriers. Available at: https://www.cancer.org/healthy/cancer-facts/cancer-facts-for-lesbian-and-bisexual-women.html. Accessed April 5, 2021.

42. Canadian Cancer Society. Screening in LGBTQ communities. Available at: https://www.cancer.ca/en/prevention-and-screening/reduce-cancer-risk/find-cancer-early/screening-in-lgbtq-communities/?region=ab. Accessed April 5, 2021.

43. American Cancer Society. Breast cancer: Early detection, diagnosis, and staging.

44. Available at: http://www.cancer.org/cancer/breastcancer/detailedguide/breast-cancer-detection. Accessed August 1, 2011.

45. The Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. The palpable breast lump: information and recommendations to assist decision-making when a breast lump is detected. CMAJ 1998;158(Suppl 3):S3-S8.

46. Canadian Cancer Society. Biopsy. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/diagnosis/?region=ab. Accessed February 23, 2021.

47. Breastcancer.org. Biopsy. Available at: https://www.breastcancer.org/symptoms/testing/types/biopsy. Accessed February 23, 2021.

48. Canadian Cancer Encyclopedia. Core needle biopsy. Breast/Diagnosis/Diagnostic tests at a glance/Biopsy/Core needle biopsy. Available at: http://info.cancer.ca/cce-ecc/default. aspx?Lang=E&toc=1&cceid=3960. Accessed November 23, 2010.

49. American Cancer Society. Types of breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/types-of-breast-cancer.html. Accessed March 8, 2021.

50. Canadian Cancer Society. Ductal carcinoma. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/breast-cancer/cancerous-tumours/ductal-carcinoma/?region=ab. Accessed March 8, 2021.

51. National Breast Cancer Foundation Inc. Types. Available at: https://www.nationalbreastcancer.org/types-of-breast-cancer/. Accessed March 8, 2021.

52. Breastcancer.org. Types. Available at: https://www.breastcancer.org/symptoms/types. Accessed March 8, 2021.

53. Canadian Cancer Encyclopedia. Paget's disease of the nipple. Available at: http://info.cancer.ca/ cce-ecc/SearchDetails.aspx?lf=Paget%2527s%2520disease%2520breast&cceid=6226. Accessed November 23, 2010.

54. Canadian Cancer Encyclopedia. Rare types of breast cancer. Breast/Pathology and staging/ Types of tumours/Malignant tumours. Available at: http://info.cancer.ca/cce-ecc/default. aspx?lf=non-invasive%2520ductal%2520carcinoma&cceid=234. Accessed August 17, 2011.

55. Cancer.net. Breast cancer subtypes. Available at: https://www.cancer.net/cancer-types/breast-cancer/introduction. Accessed March 8, 2021.

56. American Cancer Society. Breast cancer HER2 status. Available at: https://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-her2-status.html. Accessed March 8, 2021.

57. Santinelli A, Pisa E, Stramazzotti D, et al. (2008). HER-2 status discrepancy between primary breast cancer and metastatic sites. Impact on target therapy. Int J Cancer 122:999-1004.

58. Breastcancer.org. Breast cancer risk factors vary by tumor subtype. Available at: http://www.breastcancer.org/risk/new_research/20090522.jsp. Accessed August 17, 2011.

59. Goldhirsch A, Ingle J, Gelber R, et al. (2009).Thresholds for therapies: highlights of the St Gallen International Expert Consensus on the primary therapy of early breast cancer Ann Oncol 2009;20:1319-1329

60. Canadian Cancer Society. Triple-negative and basal-like breast cancers. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/breast-cancer/cancerous-tumours/triple-negative-breast-cancer/?region=ab. Accessed March 8, 2021.

61. Breastcancer.org. Molecular Subtypes of Breast Cancer. Available at: https://www.breastcancer.org/symptoms/types/molecular-subtypes. Accessed March 8, 2021.

62. Komen.org. Molecular subtypes of breast cancer. Available at: https://www.komen.org/breast-cancer/diagnosis/molecular-subtypes/. Accessed March 8, 2021.

63. Kim T, Giuliano A, Lyman G. (2006). Lymphatic mapping and sentinel lymph node biopsy in early-stage breast carcinoma: a meta-analysis. Cancer 106:4-16.

64. Neumayer L, Meterissian S, McMasters K, et al. (2007). Evidence based reviews in surgery group. Canadian Association of General Surgeons and American College of Surgeons Evidence Based Reviews in Surgery. 23. ASCO recommended guidelines for sentinel lymph node biopsy for early-stage breast cancer. Evidence-based medicine. A new approach to teaching the practice of medicine. Can J Surg 50:482-484.

65. Goyal A, Mansel R. (2008). Recent advances in sentinel lymph node biopsy for breast cancer. Curr Opin Oncol 20:621-626.

66. Krag D, Anderson SJ, Julian T, et al. (2010). Sentinel-lymph-node resection compared with conventional axillary-lymph-node dissection in clinically node-negative patients with breast cancer: overall survival findings from the NSABP B-32 randomised phase 3 trial. Lancet Oncol 11:927-933.

67. Giuliano A, Hunt K, Ballman K, et al. (2011). Axillary dissection vs no axillary dissection in women with invasive breast cancer and sentinel node metastasis: a randomized clinical trial. JAMA 305:569-575.

68. American Cancer Society. Lymph node surgery for breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer/lymph-node-surgery-for-breast-cancer.html. Accessed March 8, 2021.

69. American Cancer Society. Breast cancer stages. Available at: https://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/stages-of-breast-cancer.html. Accessed March 8, 2021.

70. Canadian Cancer Society. Stages of breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/staging/?region=ab. Accessed on March 8, 2021.

71. Canadian Cancer Encyclopedia. Survival statistics for breast cancer. Breast/Pathology and staging/ Survival statistics. Available at: http://info.cancer.ca/cce-ecc/default.aspx?Lang=E&toc=10#Pathology_ staging. Accessed August 1, 2011.

72. American Cancer Society. (September 2019). How is breast cancer staged? Available at: http://www.cancer.org/Cancer/BreastCancer/ DetailedGuide/breast-cancer-staging. Accessed February 15, 2021.

73. Canadian Cancer Encyclopedia. Disease progression. Breast/Pathology and staging. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 17, 2011.

74. Cianfrocca M, Goldstein L. (2004). Prognostic and predictive factors in early-stage breast cancer. Oncologist 9:606-616.

75. Canadian Cancer Encyclopedia. Common grading system. Breast/Pathology and staging/Tumour grading. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 17, 2011.

76. Canadian Cancer Society. Prognosis and survival for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/prognosis-and-survival/?region=ab. Accessed March 8, 2021.

77. Beadle B, Woodward W, Buchholz T. (2011). The impact of age on outcome in early-stage breast cancer. Semin Radiat Oncol 21:26-34.

78. Khoury T, Kanehira K, Wang D, et al. (2010). Breast carcinoma with amplified HER2: a gene expression signature specific for trastuzumab resistance and poor prognosis. Mod Pathol 23:1364-1378.

79. Kaufman B, Mackey J, Clemens M, et al. (2009). Trastuzumab plus anastrozole versus anastrozole alone for the treatment of postmenopausal women with human epidermal growth factor receptor 2-positive, hormone receptor-positive metastatic breast cancer: results from the randomized phase III TAnDEM study. J Clin Oncol 27:5529-5537.

80. Paik S, Shak S, Tang G, et al. (2004). A multigene assay to predict recurrence of tamoxifen-treated, node-negative breast cancer. N Engl J Med 351:2817-2826.

81. Albain K, Paik S, van't Veer L. (2009). Prediction of adjuvant chemotherapy benefit in endocrine responsive, early breast cancer using multigene assays. Breast 18(Suppl 3):S141-S145.

82. Slodkowska E, Ross J. (2009). MammaPrint 70-gene signature: another milestone in personalized medical care for breast cancer patients. Expert Rev Mol Diagn 9:417-422.

83. Albain K, Barlow W, Shak S, et al; (2010). Breast Cancer Intergroup of North America. Prognostic and predictive value of the 21-gene recurrence score assay in postmenopausal women with node- positive, oestrogen-receptor-positive breast cancer on chemotherapy: a retrospective analysis of a randomised trial. Lancet Oncol 11:55-65.

84. Kelly C, Warner E, Tsoi D, et al. (2010). Review of the clinical studies using the 21-gene assay. Oncologist 15:447-456.

85. American Cancer Society. Breast cancer gene expression tests. Available at: https://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-gene-expression.html. Accessed March 8, 2021.

86. Canadian Cancer Encyclopedia. Treatment options. Breast cancer/Treatment. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed November 23, 2010.

87. American Cancer Society. Treating breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment.html. Accessed March 8, 2021.

88. Canadian Cancer Encyclopedia. Symptom management. Breast/Supportive care. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 18, 2011.

89. Canadian Cancer Encyclopedia. Mastectomy. Breast/Treatment options at a glance/surgery. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10#Treatment. Accessed November 23, 2010.

90. Canadian Breast Cancer Network. Making decisions. Available at: https://cbcn.ca/en/making-decisions. Accessed March 10, 2021.

91. Breastcancer.org. Surgery. Available at: https://www.breastcancer.org/treatment/surgery. Accessed March 10, 2021.

92. Canadian Cancer Society. Surgery for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/surgery/?region=ab. Accessed March 10, 2021.

93. WebMD cancer center. Mastectomy in men. Available at: https://www.webmd.com/breast-cancer/mastectomy. Accessed March 10, 2021.

94. Canadian Cancer Society. Breast conserving surgery. Available at: http://www.cancer.ca/Canada- wide/About%20cancer/Types%20of%20cancer/Breast-conserving%20surgery.aspx?sc_lang=en. Accessed August 18, 2011.

95. Scarth H, Cantin J, Levine M; Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. (2002). Clinical practice guidelines for the care and treatment of breast cancer. Mastectomy or lumpectomy? The choice of operation for clinical Stages I and II breast cancer (Summary of the 2002 update). CMAJ 167:154-155. https://cancer.ca/en/cancer-information/resources/publications/understanding-treatment-for-breast-cancer

96. Canadian Cancer Society. Understanding treatment for breast cancer. Available at: http://www.cancer.ca/Canada-wide/Publications/Alphabetical%20list%20of%20 publications/~/media/CCS/Canada%20wide/Files%20List/English%20files%20heading/Library%20 PDFs%20-%20English/Breast_Understanding-treatment_2011.ashx. Accessed August 18, 2011.

97. BC Cancer Agency. Breast cancer management guidelines: contraindications to radiotherapy. (Updated November 2004.) Available at: http://www.bccancer.bc.ca/HPI/CancerManagementGuidelines/Breast/Management/ContraindicationstoRadiationTherapy.html. Accessed November 23, 2010.

98. The Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. (1998). Axillary dissection. Canadian Association of Radiation Oncologists. CMAJ 158 (Suppl 3):S22-S26.

99. Canadian Cancer Encyclopedia. Axillary lymph node dissection. Breast/Treatment/Treatment options at a glance/Surgery/Lymph node removal. Available at: http://info.cancer.ca/cce-ecc/ default.aspx?toc=10&cceid=215. Accessed November 23, 2010.

100. Canadian Cancer Encyclopedia. General cancer information/Treatment/Radiation therapy/History. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=1&Lang=E#Treatment. Accessed November 23, 2010.

101. Canadian Breast Cancer Network. Radiation therapy. Available at: https://cbcn.ca/en/radiation. Accessed March 13, 2021.

102. Canadian Cancer Encyclopedia. General cancer information/Treatment/Radiation therapy/Principles. Available at: https://cancer.ca/en/cancer-information/resources/publications/radiation-therapy. Accessed November 23, 2010.

103. Canadian Cancer Society. Radiation therapy: a guide for people with cancer. (2005: p. 10.) Available at: http://www.cancer.ca/~/media/CCS/Canada%20wide/Files%20List/English%20 files%20heading/Library%20 PDFs%20-%20English/RadiationTherapy_Eng2009.ashx. Accessed November 23, 2010.

104. American Cancer Society. Radiation for breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment/radiation-for-breast-cancer.html. Accessed March 13, 2021.

105. Canadian Cancer Society. Radiation for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/radiation-therapy/?region=ab. Accessed March 13, 2021.

106. Breastcancer.org. Radiation. Available at: https://www.breastcancer.org/treatment/radiation. Accessed March 13, 2021.

107. Whelan T, Olivotto I, Levine M; Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. (2003 update.) Clinical practice guidelines for the care and treatment of breast cancer: 6. Breast radiotherapy after breast-conserving surgery. pp 3, 22.

108. American Cancer Society. Hormone therapy for breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment/hormone-therapy-for-breast-cancer.html. Accessed March 14, 2021.

109. Breastcancer.org. What is hormonal therapy. Available at: https://www.breastcancer.org/treatment/hormonal/what_is. Accessed March 14, 2021.

110. Canadian Cancer Encyclopedia. Hormonal therapy. Breast/Treatment/Treatment options at a glance. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=1&Lang=E#Treatment. Accessed November 23, 2010.

111. Canadian Cancer Society. Hormonal therapy for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/hormonal-therapy/?region=ab. Accessed March 14, 2021.

112. Wieand S, Hale K, Lee M, et al; National Surgical Adjuvant Breast and Bowel Project. Tamoxifen and breast cancer incidence among women with inherited mutations in BRCA1 and BRCA2: National Surgical Adjuvant Breast and Bowel Project (NSABP-P1) Breast Cancer Prevention Trial. JAMA 2001;286:2251-2256.

113. Canadian Cancer Encyclopedia. Anti-estrogens. Breast/Treatment/Treatment options at a glance/ Hormonal therapy. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 19, 2011.

114. National Cancer Institute. Tamoxifen fact sheet. Available at: http://www.cancer.gov/cancertopics/ factsheet/ Therapy/Fs7_16.pdf. Accessed August 19, 2011.

115. AstraZeneca Canada Inc. (September 2010). Nolvadex® – D (tamoxifen citrate) product monograph. Available at: http://www.astrazeneca.ca/documents/ProductPortfolio/NOLVADEX_PM_en.pdf. Accessed November 23, 2010.

116. Love R, Mazess R, Barden H, et al. (1992). Effects of tamoxifen on bone mineral density in postmenopausal women with breast cancer. N Engl J Med 326:852-885.

117. Gail M, Costantino J, Bryant J, et al. (1999). Weighing the risks and benefits of tamoxifen treatment for preventing breast cancer. J Natl Cancer Inst 91:1829-1846.

118. Martino S, Costantino J, McNabb M, et al. (2004). The role of selective estrogen receptor modulators in the prevention of breast cancer: comparison of the clinical trials. Oncologist 9:116-125.

119. AstraZeneca Canada Inc. (January 21, 2011). Faslodex® (fulvestrant injection) product monograph.

120. Canadian Cancer Encyclopedia. Aromatase inhibitors. Breast/Treatment/Treatment options at a glance/ Hormonal therapy. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 19, 2011.

121. Canadian Cancer Encyclopedia. Potential side effects – aromatase inhibitors. Breast/Treatment/ Treatment options at a glance/Hormonal therapy/Aromatase inhibitors. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 19, 2011.

122. Burstein HJ, Prestrud A, Seidenfeld J, et al. (2010). American Society of Clinical Oncology clinical practice guideline: update on adjuvant endocrine therapy for women with hormone receptor-positive breast cancer. J Clin Oncol 28:3784-3796.

123. Canadian Cancer Encyclopedia. Ovarian ablation. Breast/Treatment/Treatment options at a glance/Hormonal therapy. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 19, 2011.

124. Goel S, Sharma R, Hamilton A, Beith J. (2009, October 17). LHRH agonists for adjuvant therapy of early breast cancer in premenopausal women. Cochrane Database Syst Rev (4):CD004562. https://cancer.ca/en/cancer-information/resources/publications/chemotherapy-and-other-drug-therapies

125. Canadian Cancer Society. (2004). Chemotherapy: a guide for people with cancer. Available at: http://www.cancer.ca/~/media/CCS/Canada%20wide/Files%20List/English%20files%20heading/ Library%20PDFs%20-%20English/Chemotherapy_Eng2009.ashx. Accessed November 23, 2010.

126. Canadian Cancer Encyclopedia. Chemotherapy. Treatment options at a glance/Breast cancer. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 3, 2011.

127. Canadian Cancer Society. Chemotherapy for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/chemotherapy/?region=ab. Accessed March 14, 2021.

128. Canadian Cancer Society. Chemotherapy for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/chemotherapy/?region=ab. Accessed March 14, 2021.

129. Cancer Care Ontario. Drug formulary chemotherapy regimens. Available at: https://www.cancercareontario.ca/en/drugformulary/regimens. Accessed September 9, 2021.

130. Mouret-Reynier M, Abrial C, Ferrière J, et al. (2004). Neoadjuvant FEC 100 for operable breast cancer: eight-year experience at Centre Jean Perrin. Clin Breast Cancer 5:303-307.

131. Canadian Cancer Encyclopedia. Bladder damage and chemotherapy. General cancer information/ Treatment/ Chemotherapy/Potential side effects/Organ damage and chemotherapy. Available at: http:// info.cancer.ca/cce-ecc/default.aspx?lf=cystitis&cceid=5249&toc=1. Accessed August 20, 2011.

132. Canadian Cancer Encyclopedia. Colony-stimulating factors. General cancer information/ Treatment/Biological therapy types. Available at: http://info.cancer.ca/cce-ecc/default. aspx?lf=filgrastim&cceid=415. Accessed August 20, 2011.

133. Cancer.net. Anemia. Available at: https://www.cancer.net/coping-with-cancer/physical-emotional-and-social-effects-cancer/managing-physical-side-effects/anemia. Accessed March 19, 2021.

134. Canadian Cancer Encyclopedia. Thrombocytopenia. General cancer information/Supportive care/ Bone marrow suppression. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=1. Accessed August 20, 2011.

135. Vadhan-Raj S. (2009). Management of chemotherapy-induced thrombocytopenia: current state of thrombopoietic agents. Semin Hematol 46(Suppl 2):S26-S32.

136. Canadian Cancer Encyclopedia. Potential side effects – chemotherapy. Breast/Treatment/Treatment options at a glance/Chemotherapy. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 19, 2011.

137. Canadian Cancer Society. Cognitive problems. Available at: https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/managing-side-effects/cognitive-problems/?region=ab. Accessed March 19, 2021.

138. Cancer.net. Attention, thinking, and memory problems. Available at: https://www.cancer.net/coping-with-cancer/physical-emotional-and-social-effects-cancer/managing-physical-side-effects/attention-thinking-and-memory-problems. Accessed March 19, 2021.

139. Breastcancer.org. Nail changes. Available at: https://www.breastcancer.org/treatment-side-effects/nail-changes. Accessed March 16, 2021.

140. American Cancer Society. Chemotherapy for breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment/chemotherapy-for-breast-cancer.html. Accessed March 16, 2021.

141. Patt D, Duan Z, Fang S, et al. (2007). Acute myeloid leukemia after adjuvant breast cancer therapy in older women: understanding risk. J Clin Oncol 25:3871-3876.

142. Canadian Cancer Encyclopedia. Late effects of treatment/General cancer information/Supportive care/ Surviving cancer. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=1. Accessed August 20, 2011.

143. Canadian Cancer Society. Targeted therapy for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/targeted-therapy/?region=ab. Accessed March 16, 2021.

144. American Cancer Society. Targeted drug therapy for breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment/targeted-therapy-for-breast-cancer.html. Accessed March 16, 2021.

145. Cancer Care Ontario. Drug formulary. Available at: https://www.cancercareontario.ca/en/cancer-treatments/chemotherapy/drug-formulary. Accessed March 20, 2021.

146. Hoffman-La Roche Limited (2010, September). Herceptin® (trastuzumab) product monograph..

147. Canadian Cancer Society. Immunotherapy for breast cancer. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/treatment/immunotherapy/?region=ab. Accessed March 16, 2021.

148. American Cancer Society. Immunotherapy for breast cancer. Available at: https://www.cancer.org/cancer/breast-cancer/treatment/immunotherapy.html. Accessed March 16, 2021.

149. Ambrosone C, Zirpoli G, Hutson A, et al. (2020, March 10). Dietary supplement use during chemotherapy and survival outcomes of patients with breast cancer enrolled in a cooperative group clinical trial (SWOG S0221). J Clin Oncol. 38(8):804-814. doi: 10.1200/JCO.19.01203. Epub 2019 Dec 19. PMID: 31855498; PMCID: PMC7062457.

150. Canadian Cancer Society. Complementary therapies. Available at: https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/complementary-therapies/?region=ab. March 21, 2021.

151. Canadian Cancer Encyclopedia. Osteoporosis and breast cancer. Breast/Supportive care/Symptom management. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=1&Lang=E#Supportive_ care. Accessed November 23, 2010.

152. Boyle W, Simone W, Lacey D. (2003). Osteoclast differentiation and activation. Nature 423:337-342.

153. Canadian Cancer Society. Osteoporosis. Available at: https://www.cancer.ca/en/cancer-information/diagnosis-

and-treatment/managing-side-effects/osteoporosis/?region=ab. Accessed March 22, 2021.

154. Hofbauer L, Schoppet M. (2004). Clinical implications of the osteoprotegerin/RANKL/RANK system for bone and vascular diseases. JAMA 292:490-495.

155. Osteoporosis. Treatment. Available at: https://osteoporosis.ca/about-the-disease/treatment/. Accessed March 22, 2021.

156. Saad F, Adachi J, Brown J, et al. (2008). Cancer treatment-induced bone loss in breast and prostate cancer. J Clin Oncol 26:5465-5476.

157. Canadian Cancer Encyclopedia. Bisphosphonates. Breast/Treatment/Treatment options at a glance. Available at: http://info.cancer.ca/cce-ecc/default.aspx?Lang=E&toc=10&cceid=3787#Treatment. Accessed November 23, 2010.

158. Amgen Canada Inc. (April 4, 2011). Prolia®(denosumab) product monograph.

159. McClung M, Lewiecki E, Cohen S, et al. (2006). Denosumab in postmenopausal women with low bone mineral density. N Engl J Med 354:821-831.

160. Cummings S, San Martin J, McClung M, et al. (2009). Denosumab for prevention of fractures in postmenopausal women with osteoporosis. N Engl J Med 361:756-765.

161. Canadian Cancer Encyclopedia. Signs and symptoms of bone metastases. Metastatic cancer/Bone metastases. Available at: http://info.cancer.ca/cce-ecc/default.aspx?lf=bone%2520&cceid=8123. Accessed August 20, 2011.

162. Amgen Canada Inc. (May 10, 2011). Xgeva®(denosumab) product monograph.

163. Canadian Cancer Encyclopedia. Reconstruction. Breast/Supportive care/Reconstruction. Available at: http://info.cancer.ca/cce-ecc/default.aspx?Lang=E&toc=10&cceid=3787#Treatment. Accessed November 23, 2010.

164. Canadian Cancer Encyclopedia. Breast implants. Breast/Supportive care/Reconstruction. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 20, 2011.

165. Canadian Cancer Society. Types of breast reconstruction. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/reconstruction-and-prostheses/types-of-breast-reconstruction/?region=ab. March 22, 2021.

166. Canadian Cancer Encyclopedia. TRAM flap. Breast/Supportive care/Reconstruction. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 20, 2011.

167. Canadian Cancer Encyclopedia. LATS flap. Breast/Supportive care/Reconstruction. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10. Accessed August 20, 2011.

168. Canadian Cancer Society. Choosing to stay flat. Available at: https://www.cancer.ca/en/cancer-information/cancer-type/breast/reconstruction-and-prostheses/choosing-to-stay-flat/?region=ab. March 22, 2021.

169. Canadian Breast Cancer Network. Living flat or asymmetrical. Available at: https://cbcn.ca/en/living_flat. Accessed March 22, 2021.

170. Fisher B, Anderson S, Bryant J, et al. (2002). Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. N Engl J Med 347:1233-1241.

171. Veronesi U, Cascinelli N, Mariani L, et al. Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer. N Engl J Med 2002;347:1233-1241.

172. Chia Y, Ellis M, Ma C. (2010). Neoadjuvant endocrine therapy in primary breast cancer: indications and use as a research tool. Br J Cancer;103:759-764.

173. Mayoclinic.com. Recurrent breast cancer. Available at: http://www.mayoclinic.com/health/ recurrent-breast-cancer/DS01078/DSECTION=symptoms. Accessed August 26, 2011.

174. Canadian Cancer Encyclopedia. Chronic pain after breast cancer treatment. Breast cancer/ Supportive care/ Symptom management. Available at: http://info.cancer.ca/cce-ecc/default. aspx?Lang=E&toc=10&cceid=254. Accessed November 23, 2010.

175. World Health Organization. WHO's pain relief ladder. Available at: https://www.who.int/ncds/management/palliative-care/Infographic-cancer-pain-lowres.pdf. Accessed June 8, 2021.

176. Cancer-Pain.Org. The myth of addiction. Available at: http://www.cancer-pain.org/treatments/ addiction.html. Accessed August 20, 2011.

177. O'Shea F. The role of palliative care for women with breast cancer. An introduction to palliative care. Atlantic Breast Cancer Net. May 1, 2006. Available at: http://abcn-ca.bcans.ca/the-role-of- palliative-care-for-women-with-breast-cancer/. Accessed November 23, 2010.

178. Canadian Cancer Encyclopedia. Clinical trials—a guide for people with cancer. Available at: http://info.cancer.ca/cce-ecc/default.aspx?toc=10#. Accessed August 27, 2011.

179. Canadian Cancer Society. Benefits, risks and costs of clinical trials. Available at: https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/clinical-trials/benefits-risks-and-costs/?region=ab. Accessed March 23, 2021.

180. Canadian Cancer Society. Coping with emotions, Available at: https://www.cancer.ca/en/cancer-information/cancer-type/childhood-cancer-information/long-term-survivorship/emotions/?region=ab. Accessed March 23, 2021.

181. Canadian Cancer Society. Follow-up after treatment for breast cancer. Available at: https://cancer.ca/en/cancer-information/cancer-types/breast/treatment/follow-up. Accessed March 23, 2021.

FOLLOW-UP **CONTINUING CARE PLAN**

Oncology check-ups

Provider: _____

Appointment frequency: _____

Contact: _____

Side effect monitoring

You are encouraged to report new symptoms or symptoms that have lasted for a long time to your healthcare team and not necessarily wait for a follow up appointment.

Symptoms such as:

- ☐ New or worsening pain
- ☐ Unintentional weight loss
- ☐ Fatigue
- ☐ New, sudden onset swelling of a limb
- ☐ Vaginal bleeding/spotting
- ☐ Shortness of breath
- ☐ New, persistent cough
- ☐ Numbness in the limbs
- ☐ Recurring headaches

Screening tests

Early-stage	Frequency	Provider
☐ Clinical breast exam (CBE)	_____	_____
☐ Mammogram	_____	_____

Metastatic	Frequency	Provider
☐ Tumour marker test	_____	_____
☐ MRI	_____	_____
☐ CT scan	_____	_____
☐ Bone scan	_____	_____

Additional tests	Frequency	Provider
☐ Heart function test	_____	_____
☐ Pelvic exam	_____	_____
☐ Bone density	_____	_____

Ongoing treatments

Endocrine therapy

Type: _____

Frequency & duration: _____

Supportive medications

Type: _____

Frequency & duration: _____

Type: _____

Frequency & duration: _____

Type: _____

Frequency & duration: _____

Type: _____

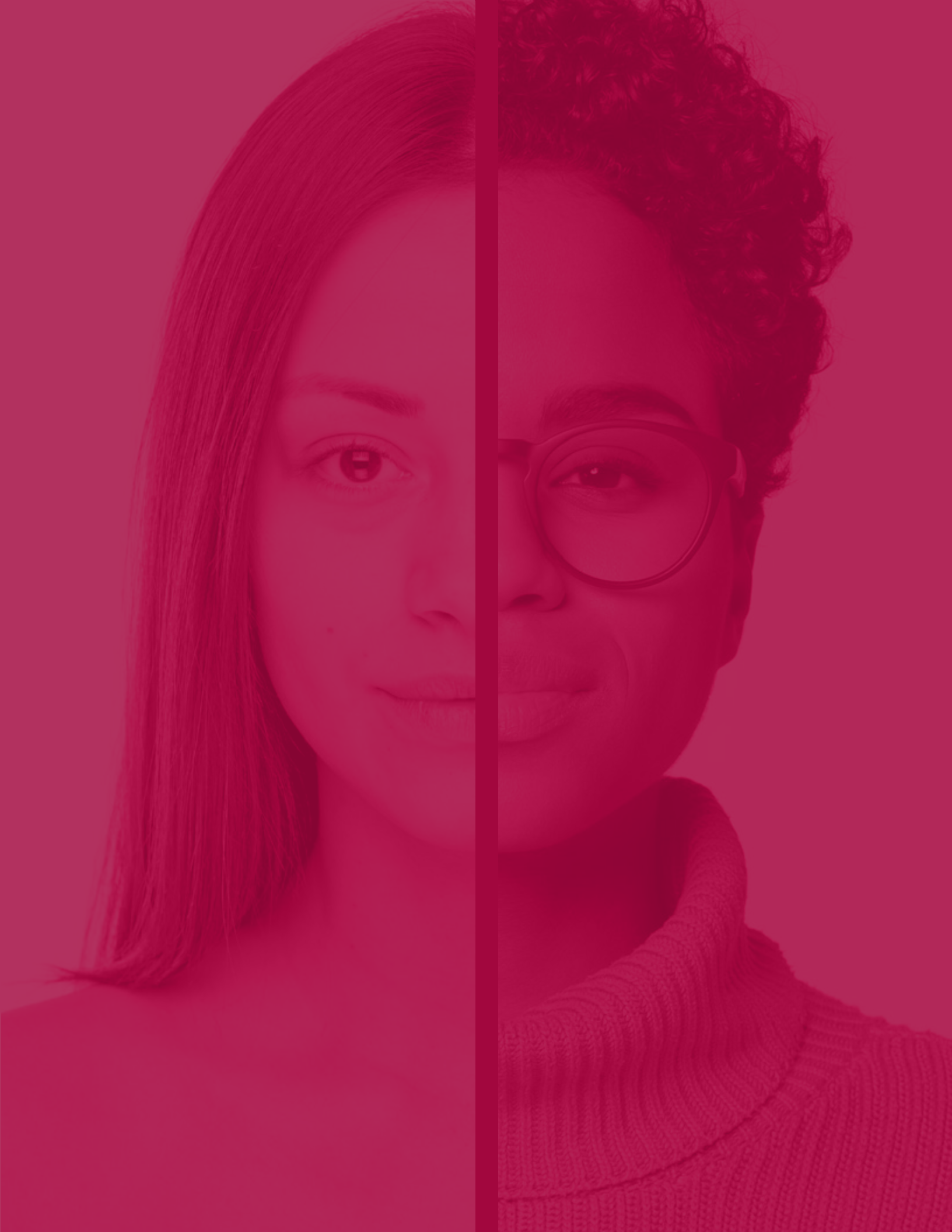
Frequency & duration: _____

Type: _____

Frequency & duration: _____

Type: _____

Frequency & duration: _____



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