



Breast Cancer



What is Breast Cancer?

Breast cancer means that malignant (cancer) cells have formed in the tissues of the breast. There are several types of breast cancer. The type depends on where it started in the breast tissue.

The breast is made up of lobes and ducts. Each breast has 15 to 20 sections called lobes. Each lobe has many smaller sections called lobules. Lobules end in dozens of tiny bulbs that can make milk. The lobes, lobules, and bulbs are linked by thin tubes called ducts.

Each breast also has blood vessels and lymph vessels. The lymph vessels carry lymph, an almost colorless fluid, between lymph nodes. Lymph nodes are small bean-shaped structures that are found throughout the body. They filter substances in lymph and help fight infection and disease. Clusters of lymph nodes are found near the breast in the axilla (armpit area), above the collarbone, and in the chest.

Axillary lymph nodes
filter lymph fluid from the breast and arm.

Fatty tissue fills the spaces around the ducts and lobules.

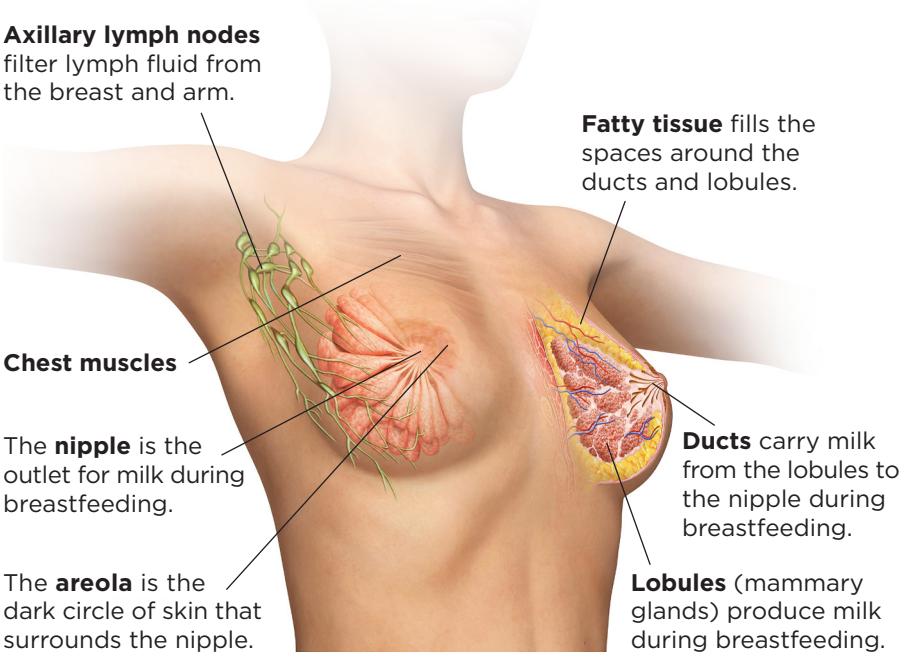
Chest muscles

The **nipple** is the outlet for milk during breastfeeding.

Ducts carry milk from the lobules to the nipple during breastfeeding.

The **areola** is the dark circle of skin that surrounds the nipple.

Lobules (mammary glands) produce milk during breastfeeding.



Types of Breast Cancer

The most common breast cancer is ductal carcinoma, which begins in the cells of the milk ducts. Cancer that begins in the lobes or lobules is called lobular carcinoma. Inflammatory breast cancer also involves the skin. In this cancer, the breast is warm, red, and swollen.

Risk Factors

Anything that increases your chance of getting a disease is called a risk factor. Having a risk factor does not always mean that you will get cancer. You may get cancer even if you do not have a risk factor because not all risk factors are known.

A family history of breast cancer and other factors increase the risk of breast cancer.

Risk factors for breast cancer include the following:

- A personal history of certain benign (non-cancer) breast disease
- A family history of breast cancer in your mother, daughter, or sister
- Inherited changes in genes that increase the risk of breast cancer such as BRCA1 or BRCA2
- Breast tissue that is dense on a mammogram
- Exposure of breast tissue to estrogen made by the body. This may be caused by:
 - Menstruating at an early age
 - Older age at first birth or never having given birth
 - Starting menopause at a later age
- Taking hormones such as estrogen combined with progestin for symptoms of menopause
- Radiation therapy to the breast or chest in the past
- Drinking alcohol
- Obesity
- Getting older

Breast cancer may be caused by inherited gene mutations (changes).

Genes in cells carry hereditary information from a person's parents. Hereditary breast cancer makes up about 5 to 10 out of 100 breast cancers. Some mutated genes related to breast cancer are more common in certain ethnic groups.

Women who have certain gene mutations, such as a BRCA1 or BRCA2 mutation, have an increased risk of breast cancer. These women also have an increased risk of ovarian cancer, and may have an increased risk of other cancers. Men who have a mutated gene related to breast cancer also have an increased risk of breast cancer.

There are tests that can detect (find) mutated genes. These genetic tests may be advised for members of families with a high risk of cancer.

Signs of Breast Cancer

These are signs of breast cancer or other conditions:

- A lump or thickening in or near the breast or in the underarm area
- A change in the size or shape of the breast
- A dimple or puckering in the skin of the breast
- A nipple turned inward into the breast
- Fluid, other than breast milk, from the nipple, especially if it is bloody
- Scaly, red, or swollen skin on the breast, nipple, or areola (the dark area of skin around the nipple)
- Dimples in the breast that look like the skin of an orange, called peau d'orange (poh dor-ahnj)

Tests for Breast Cancer

Tests are done that examine the breasts to find and diagnose breast cancer.

The following tests and procedures may be used to find and diagnose breast cancer:

- **Physical exam and history.**
- **Clinical breast exam (CBE):** An exam of the breast by a doctor or other health professional. The doctor will carefully feel the breasts and under the arms for lumps or anything else that seems unusual.
- **Mammogram:** An x-ray of the breast.
- **Ultrasound exam:** A procedure in which high-energy sound waves (ultrasound) are bounced off internal tissues or organs and make echoes. The echoes form a picture of body tissues called a sonogram.
- **MRI (magnetic resonance imaging):** A procedure that uses a magnet, radio waves, and a computer to make a series of detailed pictures of both breasts. This procedure is also called nuclear magnetic resonance imaging (NMRI).
- **Biopsy:** A procedure in which a sample of tissue is taken from the breast. A pathologist (a doctor who works in a lab) looks at the sample to see if the tissue is benign, cancerous, or atypical (a high risk for cancer). Four types of biopsies are used to check for breast cancer:
 - **Excisional biopsy:** Removal of all of an area of concern.
 - **Incisional biopsy:** Removal of part of an area of concern or a sample of tissue.
 - **Core biopsy:** Using a biopsy device to remove several samples of tissue from an area of concern.
 - **Fine-needle aspiration (FNA) biopsy:** Using a thin needle to remove some cells or fluid from an area of concern.

If cancer is found, more tests are done to study these cancer cells.

Decisions about the best treatment are based on the results of the tests. The tests give information about:

- How quickly the cancer may grow
- How likely it is that the cancer could spread through the body
- How well certain treatments might work
- How likely the cancer is to recur (come back)

Tests include the following:

- **Estrogen and progesterone receptor test:** A test to check for estrogen and progesterone (hormones) receptors in cancer tissue. If estrogen and progesterone receptors are present, the cancer is called estrogen and/or progesterone receptor positive. The test results show whether treatment to block estrogen and progesterone may stop the cancer from growing.
- **Human epidermal growth factor type 2 receptor (HER2) test:** A laboratory test to measure how many HER2 genes there are and how much HER2 protein is made in a sample of tissue. If there are more HER2 genes or higher levels of HER2 protein than normal, the cancer is called HER2 positive. This type of breast cancer may grow more quickly and is more likely to spread to other parts of the body. The cancer may be treated with drugs that target the HER2 protein.
- **Multigene tests:** Tests in which samples of tissue are studied to look at the activity of many genes at the same time. These tests may help predict whether cancer will spread to other parts of the body or recur (come back).

Based on these tests, breast cancer is described as one of the following types:

- Hormone receptor positive (estrogen and/or progesterone receptor positive) or hormone receptor negative (estrogen and/or progesterone receptor negative).

- HER2 positive or HER2 negative.
- Triple negative (estrogen receptor, progesterone receptor, and HER2 negative).

This information helps the doctor decide which treatments will work best for your cancer.

The prognosis (chance of recovery) and treatment options depend on the following:

- The stage of the cancer (the size of the tumor and whether it is in the breast only or has spread to lymph nodes or other places in the body)
- The type of breast cancer
- Hormone receptor and HER2 status
- The tumor grade (how different the cancer cell looks than a normal cell and how fast the cells divide and grow)
- How likely the tumor is to recur (come back)
- A woman's age, general health, and menopausal status (whether a woman is still having menstrual periods)
- Whether the cancer has just been diagnosed or has recurred (come back)

After breast cancer is diagnosed, tests are done to find out if cancer cells have spread within the breast or to other parts of the body.

The process used to find out whether the cancer has spread within the breast or to other parts of the body is called staging. The information gathered from the staging process determines the stage of the disease. It is important to know the stage in order to plan treatment. The results of some of the tests used to diagnose breast cancer are also used to stage the disease.

The following tests and procedures also may be used in the staging process, though not every person needs every test:

- **Sentinel lymph node biopsy:** The removal of the sentinel lymph node or nodes during surgery. The sentinel lymph node or nodes are the first lymph nodes to receive lymph drainage from a tumor. These are the first lymph nodes the cancer is likely to spread to from the tumor. A radioactive substance and/or blue dye is injected near the tumor. The substance or dye flows through the lymph ducts to the lymph nodes. The first lymph nodes to receive the substance or dye are removed. A pathologist views the tissue under a microscope to look for cancer cells. If no cancer cells are found, it may not be necessary to remove more lymph nodes.
- **Chest x-ray:** An x-ray of the organs and bones inside the chest. An x-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body.
- **CT scan (CAT scan):** A procedure that makes a series of detailed pictures of areas inside the body, taken from different angles. The pictures are made by a computer linked to an x-ray machine. A special dye (contrast) may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.
- **Bone scan:** A procedure to check if there are rapidly dividing cells, such as cancer cells, in the bone. A very small amount of radioactive material is injected into a vein and travels through the bloodstream. The radioactive material collects in the bones with cancer and is detected by a scanner.
- **PET scan (positron emission tomography scan):** A procedure to find malignant tumor cells in the body. A small amount of radioactive glucose (sugar) is injected into a vein. The PET scanner rotates around the body and makes a picture of where glucose is being used in the body. Malignant tumor cells show up brighter in the picture because they are more active and take up more glucose than normal cells do.

Cancer may spread from where it began to other parts of the body.

When cancer spreads to another part of the body, it is called metastasis. Cancer cells break away from where they began (the primary tumor) and travel through the lymph system or blood.

Cancer can spread through tissue, the lymph system, and the blood:

- **Tissue.** The cancer spreads from where it began by growing into nearby areas.
- **Lymph system.** The cancer spreads from where it began by getting into the lymph system. The cancer travels through the lymph vessels to other parts of the body.
- **Blood.** The cancer spreads from where it began by getting into the blood. The cancer travels through the blood vessels to other parts of the body.

TNM staging

Your doctor may use these words as part of your pathology report.

- **T** is for Tumor. This describes the size and spread of the main tumor.
- **N** is for Nodes. This describes if cancer has spread to nearby lymph nodes.
- **M** is for Metastases. This explains the location of spread to other organs or to distant lymph nodes.

Breast Cancer Stages

Breast cancer staging tells if the disease has spread. Breast cancer stages are described as 0 (zero) to IV (four). The lower the number, the less the cancer has spread. The stage is based on the tumor and lymph nodes removed during surgery and on other tests.

Other factors in staging include:

- Estrogen Receptor (if present, called positive)
- Progesterone Receptor (if present, called positive)
- HER2 status (a protein, if more than normal, called positive)
- Triple negative (estrogen receptor, progesterone receptor, and HER2 negative)
- Grade (how different the cancer cell looks than a normal cell and how fast the cells divide and grow)
- Multi-gene testing may be included in the reporting. This will help to decide in some cases if chemotherapy is advised or not

Stage I (one)

Cancer has formed; divided into stages IA and IB.

Stage II (two)

Divided into stages IIA and IIB.

Stage III (three)

Divided into stages IIIA, IIIB, and IIIC.

Stage IV (four)

Also called metastatic; cancer has spread to other parts of the body, such as the bone, lung, brain, or liver.

Staging Factor	Results	Comments
Estrogen receptor		
Progesterone receptor		
HER2		
Triple negative (estrogen receptor, progesterone receptor, HER2 negative)		
Grade		
Stage		
Multi-gene testing		

Inflammatory Breast Cancer

Inflammatory breast cancer means the cancer has spread to the skin of the breast. The breast looks red and swollen, and feels warm. The redness and warmth occur because cancer cells block the lymph vessels in the skin. The skin of the breast may appear dimpled, called peau d'orange (like the skin of an orange). There may not be any lumps in the breast that can be felt. Inflammatory breast cancer may be stage IIIB, stage IIIC, or stage IV.

Recurrent Breast Cancer

Recurrent breast cancer is cancer that has come back after it has been treated. The cancer may come back in the breast, in the skin of the breast, in the chest wall, in nearby lymph nodes, or distant sites.

Breast Cancer Treatment

Different types of treatment are available for patients with breast cancer. Some treatments are standard (the currently used treatment), and some are being tested in clinical trials. These clinical trials are research studies meant to help improve current treatments or obtain information on new treatments for patients with cancer. When clinical trials show that a new treatment is better than the standard treatment, the new treatment may become the standard treatment. Patients may want to think about taking part in a clinical trial. Some clinical trials are open only to patients who have not started treatment.

Five Types of Standard Treatment

Surgery

Most patients with breast cancer have surgery to remove the cancer. Types of surgery include the following:

- **Breast-conserving surgery:** An operation to remove the cancer and some normal tissue around it, but not the breast itself. Part of the chest wall lining may also be removed if the cancer is near it. This type of surgery may also be called lumpectomy, partial mastectomy, segmental mastectomy, quadrantectomy, or breast-sparing surgery.
- **Total mastectomy:** Surgery to remove the whole breast that has cancer. This procedure is also called a simple mastectomy. Some of the lymph nodes under the arm may be removed and checked for cancer. This may be done at the same time as the breast surgery or after. This is done through a separate incision.
- **Modified radical mastectomy:** Surgery to remove the whole breast that has cancer, many of the lymph nodes under the arm, the lining over the chest muscles, and sometimes, part of the chest wall muscles.

If a patient is going to have a mastectomy, breast reconstruction (surgery to rebuild a breast's shape after a mastectomy) may be considered. Breast reconstruction may be done at the time of the mastectomy or at some time after. The reconstructed breast may be made with the patient's own (non-breast) tissue or by using implants filled with saline or silicone gel.

Chemotherapy

Chemotherapy is a cancer treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing. When chemotherapy is taken by mouth or injected into a vein or muscle, the drugs enter the bloodstream and can reach cancer cells throughout the body (systemic chemotherapy). When chemotherapy is placed directly into the cerebrospinal fluid, an organ, or a body cavity such as the abdomen, the drugs mainly affect cancer cells in those areas (regional chemotherapy).

The way the chemotherapy is given depends on the type and stage of the cancer being treated. Systemic chemotherapy is used in the treatment of breast cancer.

When given before surgery, chemotherapy may shrink the tumor and reduce the amount of tissue that needs to be removed during surgery. Treatment given before surgery is called preoperative therapy or **neoadjuvant therapy**.

After the doctor removes all the cancer that can be found at the time of the surgery, some patients may be given radiation therapy, chemotherapy, targeted therapy, or hormone therapy to kill any cancer cells that may be left. Treatment given after the surgery, to lower the risk that the cancer will come back, is called postoperative therapy or **adjuvant therapy**.

Radiation Therapy

Radiation therapy is a cancer treatment that uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing. The way the radiation therapy is given depends on the type and stage of the cancer being treated.

There are two types of radiation therapy:

- **External radiation therapy** uses a machine outside the body to send radiation toward the cancer.
- **Internal radiation therapy** uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer.

Hormone Therapy

Hormone therapy is a cancer treatment that removes hormones or blocks their action and stops cancer cells from growing. Hormones are substances made by glands in the body and travel in the bloodstream. Some hormones can cause certain cancers to grow. If tests show that the cancer cells have places where hormones can attach (receptors), drugs, surgery, or radiation therapy is used to reduce the production of hormones or block them from working. The hormone estrogen, which makes some breast cancers grow, is made mainly by the ovaries. Treatment to stop the ovaries from making estrogen is called ovarian ablation.

Targeted Therapy

Targeted therapy is a type of treatment that uses drugs or other substances to identify and attack specific cancer cells without harming normal cells. Monoclonal antibodies, tyrosine kinase inhibitors, cyclin-dependent kinase inhibitors, mammalian target of rapamycin (mTOR) inhibitors, and PARP inhibitors are types of targeted therapies used in the treatment of breast cancer.

Monoclonal antibody therapy is a cancer treatment that uses antibodies made in the laboratory, from a single type of immune system cell. These antibodies can identify substances on cancer cells or normal substances that may help cancer cells grow. The antibodies attach to the substances and kill the cancer cells, block their growth, or keep them from spreading. Monoclonal antibodies are given by infusion. They may be used alone or to carry drugs, toxins, or radioactive material directly to cancer cells. Monoclonal antibodies may be used in combination with chemotherapy as adjuvant therapy.

Treatment for breast cancer may cause side effects.

Some treatments for breast cancer may cause side effects that continue or appear months or years after treatment has ended. These are called late effects.

Late effects depend on the drugs used, but may include:

- Heart failure
- Blood clots
- Premature menopause
- Second cancer, such as leukemia

Late effects of radiation therapy are not common, but may include:

- Inflammation of the lung after radiation therapy to the breast, especially when chemotherapy is given at the same time.
- Arm lymphedema, especially when radiation therapy is given after lymph node dissection.
- In women younger than 45 years who receive radiation therapy to the chest wall after mastectomy, there may be a higher risk of developing breast cancer in the other breast.

Clinical Trials

Clinical trials are done to find out if new cancer treatments are safe and effective or better than the standard treatment.

People who take part in a clinical trial may receive:

- The standard drugs alone or
- The standard drugs plus the new treatment being studied

Many of today's standard treatments for cancer are based on earlier clinical trials. Ask if there is a clinical trial right for you.

Taking part in a clinical trial helps improve the way cancer will be treated in the future. Even when clinical trials do not lead to effective new treatments, they often answer important questions and help move research forward.

Some clinical trials only include people who have not yet received treatment. Other trials test treatments for those whose cancer has not gotten better. There are also clinical trials that test new ways to stop cancer from coming back or reduce the side effects of cancer treatment.

As Treatment Progresses

Some tests may be repeated to see how well your treatment is working. Decisions about whether to continue, change, or stop treatment may be based on the results of these tests.

A plan for your long term care will be discussed with your treatment team and shared with your primary care provider.

Learn More About Breast Cancer

- **Edith Sanford Breast Center**
edith.sanfordhealth.org
- **American Cancer Society**
cancer.org
- **National Cancer Institute**
cancer.gov
- **National Comprehensive Cancer Network Guidelines for Patients**
nccn.org/patients/guidelines/cancers.aspx
- **MedlinePlus**
medlineplus.gov
- **Young Survivor Coalition**
youngsurvival.org

Things to Discuss With Your Doctor

What is the stage of my cancer?

What does my pathology report tell me?

Estrogen receptor status	
Progesterone receptor status	
HER2	
Recurrence score (if applicable)	

What are my goals for treatment?

What are my treatment choices?

What kind of support services are available for me about finances, emotions, spiritual, fertility questions, etc.?

My Health Care Team	Contact Information
Navigator:	
Surgeon:	
Medical Oncologist:	
Pharmacy:	
Radiation Oncologist:	
Primary Care Doctor:	
Genetic Counselor:	
Counselor/Therapist:	
Other:	
Other:	

The content of this booklet was adapted from content originally published by the National Cancer Institute. PDQ® Adult Treatment Editorial Board. PDQ Breast Cancer Treatment. <https://www.cancer.gov/types/breast/patient/breast-treatment-pdq>

