



Breast Cancer

What is breast cancer?

Breast cancer starts when cells in the breast begin to grow out of control. These cells usually form a tumor that can often be seen on an x-ray or felt as a lump. The tumor is malignant (cancerous) if the cells can grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. Breast cancer occurs almost entirely in women, but men can get it, too.

Cells in nearly any part of the body can become cancer, and can spread to other areas of the body. To learn more about how all cancers start and spread, see *What Is Cancer?*

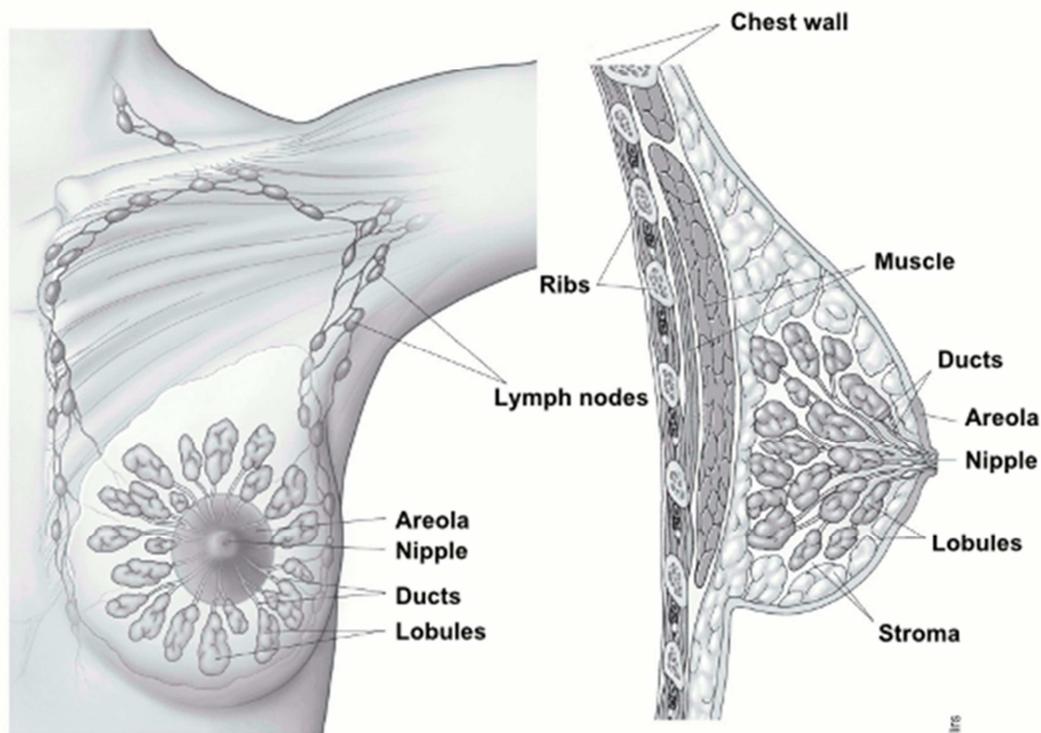
This information refers only to breast cancer in women. For information on breast cancer in men, see *Breast Cancer in Men*.

Breast cancers can start from different parts of the breast. Most breast cancers begin in the ducts that carry milk to the nipple (ductal cancers). Some start in the glands that make breast milk (lobular cancers). There are also other types of breast cancer that are less common.

A small number of cancers start in other tissues in the breast. These cancers are called *sarcomas* and *lymphomas* and are not really thought of as breast cancers.

Although many types of breast cancer can cause a lump in the breast, not all do. There are other symptoms of breast cancer you should watch out for and report to a health care provider.

It's also important to understand that most breast lumps are not cancer, they are benign. Benign breast tumors are abnormal growths, but they do not spread outside of the breast and they are not life threatening. But some benign breast lumps can increase a woman's risk of getting breast cancer. Any breast lump or change needs to be checked by a health care provider to determine whether it is benign or cancer, and whether it might impact your future cancer risk. For more information see "What are the risk factors for breast cancer?" and *Non-cancerous Breast Conditions*.



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Normal breast tissue

How Breast Cancer Spreads

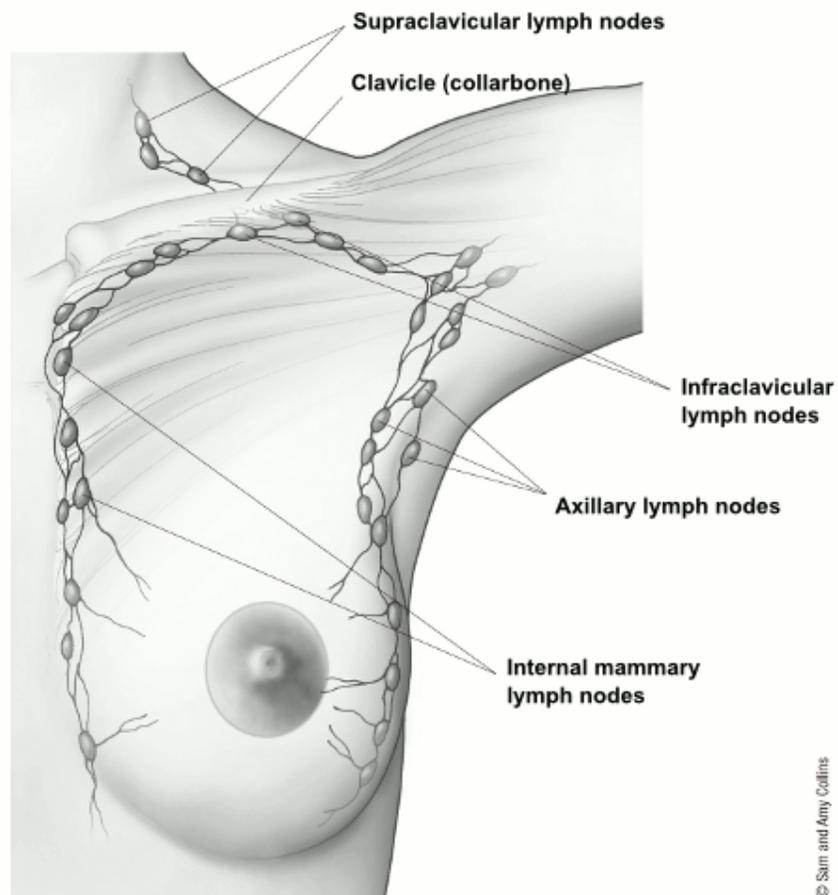
Breast cancer can spread through the lymph system.

The lymph system includes lymph nodes, lymph vessels and lymph fluid found throughout the body. Lymph nodes are small, bean-shaped collections of immune system cells that are connected by lymph (or lymphatic) vessels. Lymph vessels are like small veins, except that they carry a clear fluid called lymph (instead of blood) away from the breast. Lymph contains tissue fluid and waste products, as well as immune system cells. Breast cancer cells can enter lymph vessels and begin to grow in lymph nodes.

Most of the lymph vessels of the breast drain into:

- Lymph nodes under the arm (**axillary nodes**).
- Lymph nodes around the collar bone (**supraclavicular and infraclavicular lymph nodes**)

- Lymph nodes inside the chest near the breast bone (**internal mammary lymph nodes**)



Lymph nodes in relation to the breast

If cancer cells have spread to your lymph nodes, there is a higher chance that the cells could have spread (metastasized) to other sites in your body. The more lymph nodes with breast cancer cells, the more likely it is that the cancer may be found in other organs as well. Because of this, finding cancer in one or more lymph nodes often affects your treatment plan. Usually, surgery to remove one or more lymph nodes will be needed to know whether the cancer has spread there.

Still, not all women with cancer cells in their lymph nodes develop metastases, and some women can have no cancer cells in their lymph nodes and later develop metastases.

Types of breast cancers

Breast cancer can be separated into different types based on the way the cancer cells look under the microscope.

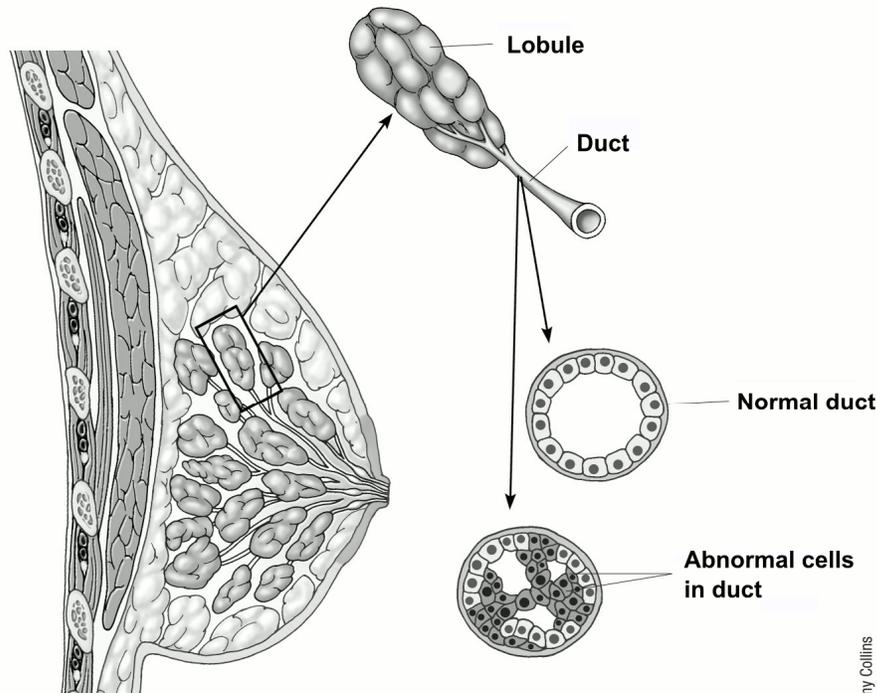
Most breast cancers are *carcinomas*, a type of cancer that starts in the cells (epithelial cells) that line organs and tissues like the breast. In fact, breast cancers are often a type of carcinoma called *adenocarcinoma*, which is carcinoma that starts in glandular tissue. Other types of cancers can occur in the breast, too, such as sarcomas, which start in the cells of muscle, fat, or connective tissue.

In some cases a single breast tumor can be a combination of different types or be a mixture of invasive and in situ cancer. And in some rarer types of breast cancer, the cancer cells may not form a tumor at all.

Breast cancer can also be classified based on proteins on or in the cancer cells, into groups like hormone receptor-positive or triple-negative. These are discussed in “How is breast cancer classified?”

Ductal carcinoma in situ

Ductal carcinoma in situ (DCIS; also known as *intraductal carcinoma*) is considered non-invasive or pre-invasive breast cancer. DCIS means that cells that lined the ducts have changed to look like cancer cells. The difference between DCIS and invasive cancer is that the cells have not spread (*invaded*) through the walls of the ducts into the surrounding breast tissue. Because it hasn't invaded, DCIS can't spread (metastasize) outside the breast. DCIS is considered a pre-cancer because some cases can go on to become invasive cancers. Right now, though, there is no good way to know for certain which cases will go on to become invasive cancers and which ones won't.



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Ductal carcinoma in situ

About 1 in 5 new breast cancer cases will be DCIS. Nearly all women diagnosed at this early stage of breast cancer can be cured.

Invasive (or infiltrating) ductal carcinoma

This is the most common type of breast cancer. Invasive (or infiltrating) ductal carcinoma (IDC) starts in a milk duct of the breast, breaks through the wall of the duct, and grows into the fatty tissue of the breast. At this point, it may be able to spread (metastasize) to other parts of the body through the lymphatic system and bloodstream. About 8 of 10 invasive breast cancers are infiltrating ductal carcinomas.

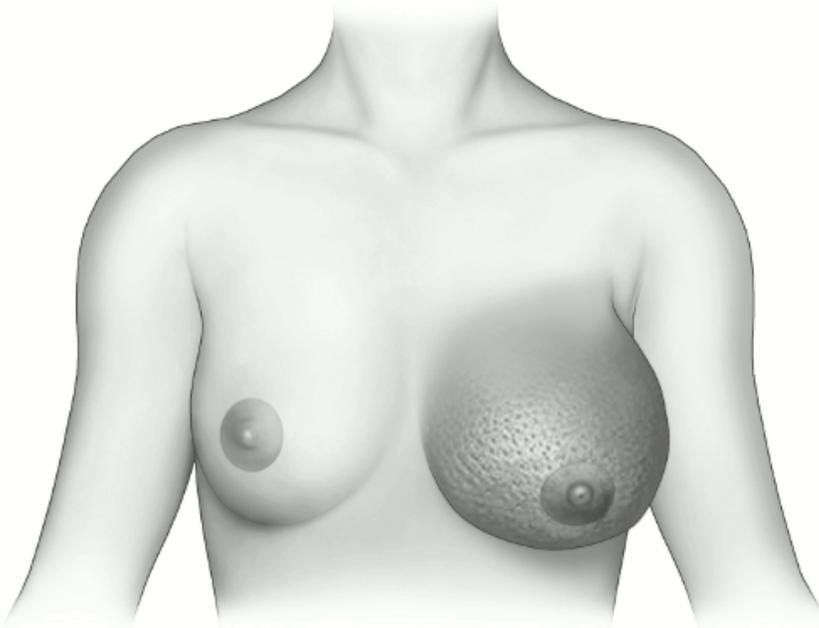
Invasive (or infiltrating) lobular carcinoma

Invasive lobular carcinoma (ILC) starts in the milk-producing glands (lobules). Like IDC, it can spread (metastasize) to other parts of the body. About 1 in 10 invasive breast cancers is an ILC. Invasive lobular carcinoma may be harder to detect by a mammogram than invasive ductal carcinoma.

Less common types of breast cancer

Inflammatory breast cancer

This uncommon type of invasive breast cancer accounts for about 1% to 3% of all breast cancers. Usually there is no single lump or tumor. Instead, inflammatory breast cancer (IBC) makes the skin on the breast look red and feel warm. It also may give the breast skin a thick, pitted appearance that looks a lot like an orange peel. Doctors now know that these changes are not caused by inflammation or infection, but by cancer cells blocking lymph vessels in the skin. The affected breast may become larger or firmer, tender, or itchy.



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Inflammatory breast cancer

In its early stages, inflammatory breast cancer is often mistaken for an infection in the breast (called *mastitis*) and treated as an infection with antibiotics. If the symptoms are caused by cancer, they will not improve, and a biopsy will find cancer cells. Because there is no actual lump, it might not show up on a mammogram, which can make it even harder to find it early. This type of breast cancer tends to have a higher chance of spreading and a worse outlook (prognosis) than typical invasive ductal or lobular cancer. For more details about this condition, see *Inflammatory Breast Cancer*.

Paget disease of the nipple

This type of breast cancer starts in the breast ducts and spreads to the skin of the nipple and then to the areola, the dark circle around the nipple. It is rare, accounting for only about 1% of all cases of breast cancer. The skin of the nipple and areola often appears crusted, scaly, and red, with areas of bleeding or oozing. The woman may notice burning or itching.

Paget disease is almost always associated with either ductal carcinoma in situ (DCIS) or infiltrating ductal carcinoma. Treatment often requires mastectomy. If no lump can be felt in the breast tissue, and the biopsy shows DCIS but no invasive cancer, the outlook (prognosis) is excellent. If invasive cancer is present, the prognosis is not as good, and the cancer will need to be staged and treated like any other invasive cancer.

Phyllodes tumor

This very rare breast tumor develops in the stroma (connective tissue) of the breast, in contrast to carcinomas, which develop in the ducts or lobules. Other names for these tumors include *phylloides tumor* and *cystosarcoma phyllodes*. These tumors are usually benign but on rare occasions may be malignant.

Benign phyllodes tumors are treated by removing the tumor along with a margin of normal breast tissue. A malignant phyllodes tumor is treated by removing it along with a wider margin of normal tissue, or by mastectomy. Surgery is often all that is needed, but these cancers might not respond as well to the other treatments used for more common breast cancers. When a malignant phyllodes tumor has spread, it can be treated with the chemotherapy given for soft-tissue sarcomas. See *Sarcoma: Adult Soft Tissue Cancer*.

Angiosarcoma

This form of cancer starts in cells that line blood vessels or lymph vessels. It rarely occurs in the breasts. When it does, it usually develops as a complication of previous radiation treatments. This is an extremely rare complication of breast radiation therapy that can develop about 5 to 10 years after radiation. Angiosarcoma can also occur in the arms of women who develop lymphedema as a result of lymph node surgery or radiation therapy to treat breast cancer. (For information on lymphedema, see "How is breast cancer treated?") These cancers tend to grow and spread quickly. Treatment is generally the same as for other sarcomas. See *Sarcoma: Adult Soft Tissue Cancer*.

Special types of invasive breast carcinoma

There are some special types of breast cancer that are sub-types of invasive carcinoma. These are often named after features seen when they are viewed under the microscope, like the ways the cells are arranged.

Some of these may have a better prognosis than standard infiltrating ductal carcinoma. These include:

- Adenoid cystic (or adenocystic) carcinoma
- Low-grade adenosquamous carcinoma (this is a type of metaplastic carcinoma)
- Medullary carcinoma
- Mucinous (or colloid) carcinoma
- Papillary carcinoma
- Tubular carcinoma

Some sub-types have the same or maybe worse prognosis than standard infiltrating ductal carcinoma. These include:

- Metaplastic carcinoma (most types, including spindle cell and squamous)
- Micropapillary carcinoma
- Mixed carcinoma (has features of both invasive ductal and lobular)

In general, all of these sub-types are still treated like standard infiltrating ductal carcinoma.

What are the key statistics about breast cancer?

Breast cancer is the most common cancer among American women, except for skin cancers. About 1 in 8 (12%) women in the US will develop invasive breast cancer during their lifetime.

Current year estimates for breast cancer

The American Cancer Society's estimates for breast cancer in the United States for 2016 are:

- About 246,660 new cases of invasive breast cancer will be diagnosed in women.
- About 61,000 new cases of carcinoma in situ (CIS) will be diagnosed (CIS is non-invasive and is the earliest form of breast cancer).
- About 40,450 women will die from breast cancer.

Trends in breast cancer incidence

After increasing for more than 20 years, breast cancer incidence rates in women began decreasing in 2000, and dropped by about 7% from 2002 to 2003. This large decrease was thought to be because fewer women used hormone therapy after menopause after the results of the Women's Health Initiative were published in 2002. This study linked using hormone therapy to an increased risk of breast cancer and heart diseases.

In recent years, incidence rates have been stable in white women, but have increased slightly in African American women.

Trends in breast cancer deaths

Breast cancer is the second leading cause of cancer death in women. (Only lung cancer kills more women each year.) The chance that a woman will die from breast cancer is about 1 in 36 (about 3%).

Death rates from breast cancer have been dropping since about 1989, with larger decreases in women younger than 50. These decreases are believed to be the result of finding breast cancer earlier through screening and increased awareness, as well as better treatments.

Breast cancer survivors

At this time there are more than 2.8 million breast cancer survivors in the United States. (This includes women still being treated and those who have completed treatment.) Survival rates are discussed in “Breast cancer survival rates, by stage.”

Visit the American Cancer Society’s Cancer Statistics Center for more key statistics.

What are the risk factors for breast cancer?

Most women who have one or more breast cancer risk factors never develop breast cancer, while many women with breast cancer have no known risk factors (other than being a woman and growing older). Even when a woman with risk factors develops breast cancer, it’s hard to know just how much these factors might have contributed.

Some risk factors, like a person's age or race, can't be changed. Other risk factors are linked to cancer-causing factors in the environment or to personal behaviors, such as smoking, drinking, and diet. Some factors affect risk more than others, and your risk for breast cancer can change over time, due to things like aging or lifestyle.

Breast cancer risk factors you cannot change

The main risk factors for breast cancer are things you cannot change: being a woman, getting older, and having certain gene changes. These make your risk of breast cancer higher. But having a risk factor, or even many, does not mean that you are sure to get the disease.

Being a woman

Simply being a woman is the main risk factor for breast cancer. Men can have breast cancer, too, but this disease is about 100 times more common in women than in men. This might be because men have less of the female hormones estrogen and progesterone, which can promote breast cancer cell growth.

Getting older

As you get older, your risk of breast cancer goes up. Most invasive breast cancers (those that have spread from where they started) are found in women age 55 and older.

Certain inherited genes

About 5% to 10% of breast cancer cases are thought to be hereditary, meaning that they result directly from gene defects (called *mutations*) passed on from a parent.

BRCA1 and BRCA2: The most common cause of hereditary breast cancer is an inherited mutation in the BRCA1 and BRCA2 genes. In normal cells, these genes help prevent cancer by making proteins that help keep the cells from growing abnormally. Mutated versions of these genes cannot stop abnormal growth, and that can lead to cancer.

- If you have inherited a mutated copy of either gene from a parent, you have a higher risk of breast cancer.
- In some families with *BRCA1* mutations the lifetime risk of breast cancer is as high as 80%, but on average this risk seems to be in the range of 55% to 65%. For *BRCA2* mutations the risk is lower, around 45%.
- Breast cancers linked to these mutations are more often found in younger women and more often in both breasts than cancers not linked to these mutations. Women with these inherited mutations also have a higher risk of developing other cancers, mainly [ovarian cancer](#).
- In the United States, *BRCA* mutations are more common in Jewish people of Ashkenazi (Eastern Europe) origin than in other racial and ethnic groups, but anyone can have them.

Changes in other genes: Other gene mutations can also lead to inherited breast cancers. These gene mutations are much less common and most of them do not increase the risk of breast cancer as much as the BRCA genes. They are seldom causes of inherited breast cancer.

- **ATM:** The *ATM* gene normally helps repair damaged DNA. Inheriting 2 abnormal copies of this gene causes the disease *ataxia-telangiectasia*. Inheriting one abnormal copy of this gene has been linked to a high rate of breast cancer in some families.
- **TP53:** The *TP53* gene gives instructions for making a protein called *p53* that helps stop the growth of abnormal cells. Inherited mutations of this gene cause *Li-Fraumeni syndrome*. People with this syndrome have an increased risk of breast cancer, as well as some other cancers such as [leukemia](#), [brain tumors](#), and sarcomas (cancers of [bones](#) or [connective tissue](#)). This mutation is a rare cause of breast cancer.
- **CHEK2:** Li-Fraumeni syndrome can also be caused by inherited mutations in the *CHEK2* gene. A *CHEK2* mutation, even when it doesn't cause this syndrome, can increase breast cancer risk about 2-fold.
- **PTEN:** The *PTEN* gene normally helps regulate cell growth. Inherited mutations in this gene cause *Cowden syndrome*, a rare disorder that puts people at higher risk for both non-cancer and cancer tumors in the breasts, as well as growths in the digestive tract, thyroid, uterus, and ovaries. Defects in this gene can also cause a different syndrome called *Bannayan-Riley-Ruvalcaba syndrome* that's not thought to be linked to breast cancer risk. The syndromes caused by mutations in *PTEN* can be grouped together as *PTEN Tumor Hamartoma Syndrome*.
- **CDHI:** Inherited mutations in this gene cause *hereditary diffuse gastric cancer*, a syndrome in which people develop a rare type of [stomach cancer](#). Women with mutations in this gene also have an increased risk of invasive lobular breast cancer.
- **STK11:** Defects in this gene can lead to *Peutz-Jeghers syndrome*. People affected with this disorder have pigmented spots on their lips and in their mouths, polyps in the urinary and gastrointestinal tracts, and a higher risk of many types of cancer, including breast cancer.
- **PALB2:** The *PALB2* gene makes a protein that interacts with the protein made by the *BRCA2* gene. Mutations in this gene can lead to a higher risk of breast cancer. It isn't yet clear if *PALB2* gene mutations also increase the risk for ovarian cancer and [male breast cancer](#).

For more on this, see [Family Cancer Syndromes](#).

Genetic testing: Genetic testing can be done to look for mutations in the BRCA1 and BRCA2 genes (or less commonly in other genes such as *PTEN* or *TP53*). While testing can be helpful in some cases, the pros and cons need to be considered carefully.

If you're thinking about genetic testing, it's strongly recommended that you first talk to a genetic counselor, nurse, or doctor who can explain and interpret the results of these tests. It's very important to understand what genetic testing can and can't tell you, and to carefully weigh the benefits and risks of genetic testing before these tests are done. Testing costs a lot and might not be covered by some health insurance plans.

For more, see [*Genetic Testing: What You Need to Know*](#).

Having a family history of breast cancer

It's important to note that most women (about 8 out of 10) who get breast cancer *do not* have a family history of the disease, but:

- Women who have close blood relatives with breast cancer have a higher risk of the disease.
- Having a first-degree relative (mother, sister, or daughter) with breast cancer almost doubles a woman's risk. Having 2 first-degree relatives increases her risk about 3-fold.
- Women with a father or brother who have had breast cancer also have a higher risk of breast cancer.

Overall, less than 15% of women with breast cancer have a family member with this disease.

Having a personal history of breast cancer

A woman with cancer in one breast has a higher risk of developing a new cancer in the other breast or in another part of the same breast. (This is different from a recurrence or return of the first cancer.) This risk is even higher for younger women with breast cancer.

Your race and ethnicity

Overall, white women are slightly more likely to develop breast cancer than African-American women, but African-American women are more likely to die of this cancer. In women under 45 years of age, breast cancer is more common in African-American women. Asian, Hispanic, and Native American women have a lower risk of developing and dying from breast cancer.

Having dense breast tissue

Breasts are made up of fatty tissue, fibrous tissue, and glandular tissue. Someone is said to have dense breasts (on a mammogram) when they have more glandular and fibrous tissue and less fatty tissue. Women with dense breasts on mammogram have a risk of

breast cancer that is 1.2 to 2 times that of women with average breast density. Unfortunately, dense breast tissue can also make mammograms less accurate.

A number of factors can affect breast density, such as age, menopausal status, the use of certain drugs (including menopausal hormone therapy), pregnancy, and genetics.

For more on this see *Breast Density and Your Mammogram Report*.

Certain benign breast conditions

Women diagnosed with certain benign (non-cancer) breast conditions may have a higher risk of breast cancer. Some of these conditions are more closely linked to breast cancer risk than others. Doctors often divide benign breast conditions into 3 general groups, depending on how they affect this risk.

Non-proliferative lesions: These conditions are linked to an overgrowth of breast tissue. They don't seem to affect breast cancer risk, or if they do, it's to a very small extent. They include:

- Fibrosis and/or simple cysts (sometimes called *fibrocystic changes* or *disease*)
- Mild hyperplasia
- Adenosis (non-sclerosing)
- Phyllodes tumor (benign)
- A single papilloma
- Fat necrosis
- Duct ectasia
- Periductal fibrosis
- Squamous and apocrine metaplasia
- Epithelial-related calcifications
- Other benign tumors (lipoma, hamartoma, hemangioma, neurofibroma, adenomyoepithelioma)

Mastitis (infection of the breast) is not a tumor and does not increase the risk of breast cancer.

Proliferative lesions without atypia (cell abnormalities): In these conditions there's excessive growth of cells in the ducts or lobules of the breast. They seem to raise a woman's risk of breast cancer slightly. They include:

- Usual ductal hyperplasia (without atypia)
- Fibroadenoma
- Sclerosing adenosis
- Several papillomas (called *papillomatosis*)
- Radial scar

Proliferative lesions with atypia: In these conditions, the cells in the ducts or lobules of the breast tissue grow excessively, and some of them no longer look normal. These types of lesions include:

- Atypical ductal hyperplasia (ADH)
- Atypical lobular hyperplasia (ALH)

Breast cancer risk is raised in women with these changes. If a woman has a family history of breast cancer and either hyperplasia or atypical hyperplasia, she has an even higher risk of breast cancer.

For more on these conditions, see Non-cancerous Breast Conditions.

Lobular carcinoma in situ: In lobular carcinoma in situ (LCIS), cells that look like cancer cells are growing in the lobules of the milk-producing glands of the breast, but they do not grow through the wall of the lobules. LCIS is also called *lobular neoplasia*. It's sometimes grouped with ductal carcinoma in situ (DCIS) as a non-invasive breast cancer, but it differs from DCIS in that it doesn't seem to become invasive cancer if it isn't treated.

Women with lobular carcinoma in situ (LCIS) have a much higher risk of developing cancer in either breast.

Starting menstruation (periods) before age 12

Women who have had more menstrual cycles because they started menstruating early (before age 12) have a slightly higher risk of breast cancer. The increase in risk may be due to a longer lifetime exposure to the hormones estrogen and progesterone.

Going through menopause after age 55

Women who have had more menstrual cycles because they went through menopause later (after age 55) have a slightly higher risk of breast cancer. The increase in risk may be because they have a longer lifetime exposure to the hormones estrogen and progesterone.

Having radiation to your chest

Women who as children or young adults were treated with radiation therapy to the chest for another cancer (such as Hodgkin disease or non-Hodgkin lymphoma) have a significantly higher risk for breast cancer. This varies with the patient's age when they got radiation. And if you had chemotherapy with the radiation, it might have stopped ovarian hormone production for some time, which lowers the risk. The risk of developing breast cancer from chest radiation is highest if you had radiation during adolescence, when your breasts were still developing. Radiation treatment after age 40 does not seem to increase breast cancer risk.

For more information, see [Second Cancers Caused by Cancer Treatment](#).

Exposure to diethylstilbestrol (DES)

From the 1940s through the early 1970s some pregnant women were given an estrogen-like drug called DES because it was thought to lower their chances of losing the baby (miscarriage). These women have a slightly increased risk of developing breast cancer. Women whose mothers took DES during pregnancy may also have a slightly higher risk of breast cancer.

For more on DES see *DES Exposure: Questions and Answers*.

Lifestyle-related breast cancer risk factors

Certain breast cancer risk factors are related to personal behaviors, such as diet and exercise. Other lifestyle-related risk factors include decisions about having children and taking birth control.

Drinking alcohol

Drinking alcohol is clearly linked to an increased risk of developing breast cancer. The risk increases with the amount of alcohol consumed. Compared with non-drinkers, women who have 1 alcoholic drink a day have a very small increase in risk. Those who have 2 to 5 drinks daily have about 1½ times the risk of women who don't drink alcohol. Excessive alcohol consumption is known to increase the risk of other cancers, too.

The American Cancer Society recommends that women have no more than 1 alcoholic drink a day. A drink is 12 ounces of regular beer, 5 ounces of wine, or 1.5 ounces of 80-proof distilled spirits.

Being overweight or obese

Being overweight or obese after menopause increases breast cancer risk. Before menopause your ovaries make most of your estrogen, and fat tissue makes only a small amount. After menopause (when the ovaries stop making estrogen), most of a woman's estrogen comes from fat tissue. Having more fat tissue after menopause can raise estrogen levels and increase your chance of getting breast cancer. Also, women who are overweight tend to have higher blood insulin levels. Higher insulin levels have been linked to some cancers, including breast cancer.

Still, the link between weight and breast cancer risk is complex. For instance, risk appears to be increased for women who gained weight as an adult, but may not be increased among those who have been overweight since childhood. Also, excess fat in the waist area may affect risk more than the same amount of fat in the hips and thighs. Researchers believe that fat cells in various parts of the body have subtle differences that may explain this.

The American Cancer Society recommends you stay at a healthy weight throughout your life by balancing your food intake with physical activity and avoiding excessive weight gain.

Physical activity

Evidence is growing that physical activity in the form of exercise reduces breast cancer risk. The main question is how much exercise is needed. In one study from the Women's Health Initiative, as little as 1¼ to 2½ hours per week of brisk walking reduced a woman's risk by 18%. Walking 10 hours a week reduced the risk a little more.

To reduce your risk of breast cancer, the American Cancer Society recommends that adults get at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity activity each week (or a combination of these), preferably spread throughout the week.

Moderate activity is anything that makes you breathe as hard as you do during a brisk walk. During moderate activities, you'll notice a slight increase in heart rate and breathing. You should be able to talk, but not sing during the activity. Vigorous activities are performed at a higher intensity. They cause an increased heart rate, sweating, and a faster breathing rate. Activities that improve strength and flexibility, such as weight lifting, stretching, or yoga, are also beneficial.

Having children

Women who have not had children or who had their first child after age 30 have a slightly higher breast cancer risk overall. Having many pregnancies and becoming pregnant at an early age reduces breast cancer risk overall. Still, the effect of pregnancy is

different for different types of breast cancer. For a certain type of breast cancer known as triple-negative, pregnancy seems to increase risk.

Birth control

Oral contraceptives: Studies have found that women using oral contraceptives (birth control pills) have a slightly higher risk of breast cancer than women who have never used them. Once the pills are stopped, this risk seems to go back to normal over time. Women who stopped using oral contraceptives more than 10 years ago do not appear to have any increased breast cancer risk. When thinking about using oral contraceptives, women should discuss their other risk factors for breast cancer with their health care provider.

Birth control shot: Depo-Provera is an injectable form of progesterone that's given once every 3 months as birth control. A few studies have looked at the effect of birth control shots on breast cancer risk. Women currently using birth control shots seem to have an increase in breast cancer risk, but it appears that there is no increased risk in women 5 years after they stop getting the shots.

Hormone therapy after menopause

Hormone therapy with estrogen (often combined with progesterone) has been used for many years to help relieve symptoms of menopause and help prevent osteoporosis (thinning of the bones). This treatment goes by many names, such as post-menopausal hormone therapy (PHT), hormone replacement therapy (HRT), and menopausal hormone therapy (MHT).

There are 2 main types of hormone therapy. For women who still have a uterus (womb), doctors generally prescribe estrogen and progesterone (known as combined hormone therapy or HT). Progesterone is needed because estrogen alone can increase the risk of cancer of the uterus. For women who've had a hysterectomy (those who no longer have a uterus), estrogen alone can be used. This is known as estrogen replacement therapy (ERT) or just estrogen therapy (ET).

Combined hormone therapy (HT): Use of combined hormone therapy after menopause increases the risk of breast cancer. It may also increase the chances of dying from breast cancer. This increase in risk can be seen with as little as 2 years of use. Combined HT also increases the likelihood that the cancer may be found at a more advanced stage. (This means it's already spread from the place it started when it's found.)

The increased risk from combined HT appears to apply only to current and recent users. A woman's breast cancer risk seems to return to that of the general population within 5 years of stopping treatment.

Bioidentical hormone therapy: The word *bioidentical* is sometimes used to describe versions of estrogen and progesterone with the same chemical structure as those found naturally in people. The use of these hormones has been marketed as a safe way to treat the symptoms of menopause. It's important to realize that because there aren't many studies comparing "bioidentical" or "natural" hormones to synthetic versions of hormones, there's no proof that they're safer or more effective. More studies are needed to know for sure. The use of these bioidentical hormones should be thought to have the same health risks as any other type of hormone therapy.

Estrogen therapy (ET): The use of estrogen alone after menopause does not seem to increase the risk of breast cancer much, if at all. But when used long term (for more than 10 years), ET has been found to increase the risk of ovarian and breast cancer in some studies.

At this time there are few strong reasons to use post-menopausal hormone therapy (either combined HT or ET), other than possibly for the short-term relief of menopausal symptoms. Along with the increased risk of breast cancer, combined HT also appears to increase the risk of heart disease, blood clots, and strokes. It does lower the risk of colorectal cancer and osteoporosis, but this must be weighed against the possible harms, especially since there are other ways to prevent and treat osteoporosis and screening can sometimes prevent colon cancer. ET does not seem to increase breast cancer risk, but it does increase the risk of stroke.

The decision to use HT should be made by a woman and her doctor after weighing the possible risks and benefits (including the severity of her menopausal symptoms), and considering her other risk factors for heart disease, breast cancer, and osteoporosis. If they decide she should try HT for symptoms of menopause, it's usually best to use it at the lowest dose that works for her and for as short a time as possible.

Breastfeeding

Some studies suggest that breastfeeding may slightly lower breast cancer risk, especially if it's continued for 1½ to 2 years. But this has been hard to study, especially in countries like the United States, where breastfeeding for this long is uncommon.

The explanation for this possible effect may be that breastfeeding reduces a woman's total number of lifetime menstrual cycles (the same as starting menstrual periods at a later age or going through early menopause).

Factors with unclear effect on breast cancer risk

There are some things that might be risk factors for breast cancer, but the research is not yet clear about whether there really is a link. They include things like tobacco smoke and working at night.

Diet and vitamins

Many studies have been done looking for a link between certain diets and breast cancer risk, but so far the results have been conflicting. Results of some studies have shown that diet may play a role, while others showed no evidence that diet influences breast cancer risk.

Studies looking at vitamin levels have had inconsistent results. And some studies have found that higher levels of certain nutrients increased the risk for breast cancer in women. So far, no study has shown that taking vitamins reduces breast cancer risk. This is not to say that there's no point in eating a healthy diet. A diet low in fat, low in red meat and processed meat, and high in fruits and vegetables can have other health benefits.

Many studies of women in the United States have not linked breast cancer risk to fat in the diet. Still, studies have found that breast cancer is less common in countries where the typical diet is low in total fat, low in polyunsaturated fat, and low in saturated fat. Researchers are still not sure how to explain this. It may be at least partly due to the effect of diet on body weight (see below). Also, studies comparing diet and breast cancer risk in different countries are complicated by other differences (such as activity level, intake of other nutrients, and genetic factors) that might also affect breast cancer risk.

More research is needed to better understand the effect of the types of fat eaten on breast cancer risk. It's clear that calories do count, and fat is a major source of calories. High-fat diets can lead to being overweight or obese, which is a known breast cancer risk factor. A diet high in fat is also a risk factor for some other types of cancer. And intake of certain types of fat is clearly related to higher risk of heart disease.

Chemicals in the environment

A great deal of research has been reported and more is being done to understand possible environmental influences on breast cancer risk.

Compounds in the environment that have estrogen-like properties are of special interest. For example, substances found in some plastics, certain cosmetics and personal care products, pesticides, and PCBs (polychlorinated biphenyls) seem to have such properties. In theory, these could affect breast cancer risk.

This issue raises a great deal of public concern, but at this time research does not show a clear link between breast cancer risk and exposure to these substances. Studying such effects in humans is hard to do. More research is needed to better define the possible health effects of these substances and others like them.

Tobacco smoke

For a long time, studies showed no link between cigarette smoking and breast cancer. But in recent years, more studies have shown that heavy smoking over a long-time is linked to a higher risk of breast cancer. In some studies, the risk was highest in certain groups, such as women who started smoking before they had their first child. The 2014 US Surgeon General's report on smoking concluded that there is "suggestive but not sufficient" evidence that smoking increases the risk of breast cancer.

Researchers are also looking at whether secondhand smoke increases the risk of breast cancer. Both mainstream and secondhand smoke contain chemicals that, in high concentrations, cause breast cancer in rodents. Studies have shown that chemicals in tobacco smoke reach breast tissue and are found in breast milk of rodents.

In human studies, the evidence on secondhand smoke and breast cancer risk is not clear, at least in part because the link between smoking and breast cancer is also not clear. One reason for this might be that tobacco smoke may have different effects on breast cancer risk in smokers compared with those who are just exposed to secondhand smoke.

A report from the California Environmental Protection Agency in 2005 concluded that the evidence about secondhand smoke and breast cancer is "consistent with a causal association" in younger, mainly pre-menopausal women. The 2014 US Surgeon General's report concluded that there is "suggestive but not sufficient" evidence of a link at this point. In any case, this possible link to breast cancer is yet another reason to avoid secondhand smoke.

Night work

Some studies have suggested that women who work at night, such as nurses on a night shift, might have an increased risk of breast cancer. This is a fairly recent finding, and more studies are looking at this. Some researchers think the effect may be due to changes in levels of melatonin, a hormone that's affected by the body's exposure to light, but other hormones are also being studied.

Disproven or controversial breast cancer risk factors

There are many factors that research has shown are not linked to breast cancer. You may see information online or hear about these disproven or controversial risk factors, but it is important to learn the facts.

Antiperspirants

Internet and e-mail rumors have suggested that chemicals in underarm antiperspirants are absorbed through the skin, interfere with lymph circulation, and cause toxins to build up in the breast, eventually leading to breast cancer.

Based on the available evidence (including what we know about how the body works), there is little if any reason to believe that antiperspirants increase the risk of breast cancer. For more information, read *Antiperspirants and Breast Cancer Risk*.

Bras

Internet and e-mail rumors and at least one book have suggested that bras cause breast cancer by obstructing lymph flow. There is no good scientific or clinical basis for this claim, and a recent study of more than 1,500 women found no association between wearing a bra and breast cancer risk.

Induced abortion

Several studies have provided very strong data that neither induced abortions nor spontaneous abortions (miscarriages) have an overall effect on the risk of breast cancer. For more detailed information, read *Is Abortion Linked to Breast Cancer?*

Breast implants

Several studies have found that breast implants do not increase the risk of breast cancer, although silicone breast implants can cause scar tissue to form in the breast. Implants make breast tissue harder to see on standard mammograms, but additional x-ray pictures called implant displacement views can be used to examine the breast tissue more completely.

Breast implants might be linked to a rare type of lymphoma called anaplastic large cell lymphoma. This lymphoma has rarely been found in the breast tissue around the implants. So far, though, there are too few cases to know if the risk of this lymphoma is really higher in women with implants.

Do we know what causes breast cancer?

Many risk factors can increase your chance of developing breast cancer, but it is not yet known exactly how some of these risk factors cause cells to become cancerous. Hormones seem to play a role in many cases of breast cancer, but just how this happens is not fully understood.

Normal breast cells become cancerous because of changes (mutations) in DNA. Some DNA mutations are inherited. This means the mutations are in every cell in your body and can dramatically increase the risk for developing certain cancers. They are responsible for many of the cancers that run in some families.

But most DNA changes related to breast cancer are acquired in breast cells during a woman's life rather than having been inherited.

DNA is the chemical in each of our cells that makes up our genes. Genes have instructions for how our cells function. We usually look like our parents because they are the source of our DNA. But DNA affects more than how we look. Some genes control when our cells grow, divide into new cells, and die.

Oncogenes

Genes that speed up cell division are called oncogenes. Proto-oncogenes are genes that normally help cells grow. When a proto-oncogene mutates (changes) or there are too many copies of it, it becomes a "bad" gene that can become permanently turned on or activated when it is not supposed to be. When this happens, the cell grows out of control, which can lead to cancer. This bad gene is called an oncogene.

Think of a cell as a car. For the car to work properly, there need to be ways to control how fast it goes. A proto-oncogene normally functions in a way that is much like a gas pedal. It helps the cell grow and divide. An oncogene could be compared with a gas pedal that is stuck down, which causes the cell to divide out of control.

Tumor suppression genes

Tumor suppressor genes are normal genes that slow down cell division, repair DNA mistakes, or tell cells when to die (a process known as *apoptosis* or *programmed cell death*). When tumor suppressor genes don't work properly, cells can grow out of control, which can lead to cancer.

A tumor suppressor gene is like the brake pedal on a car. It normally keeps the cell from dividing too quickly, just as a brake keeps a car from going too fast. When something goes wrong with the gene, such as a mutation, cell division can get out of control.

Certain changes (mutations) in DNA that "turn on" oncogenes or "turn off" tumor suppressor genes can cause normal breast cells to become cancerous.

Inherited gene changes

Certain inherited DNA mutations (changes) can dramatically increase the risk for developing certain cancers and are responsible for many of the cancers that run in some families. For example, the *BRCA* genes (*BRCA1* and *BRCA2*) are tumor suppressor

genes. A change in one of these genes can be inherited from a parent. When one of these genes changes, it no longer suppresses abnormal growth, and cancer is more likely to develop.

Women have already begun to benefit from advances in understanding the genetic basis of breast cancer. Genetic testing can identify some women who have inherited mutations in the *BRCA1* or *BRCA2* tumor suppressor genes (or less commonly in other genes such as *PTEN* or *TP53*). These women can then take steps to reduce their risk of developing breast cancers and to monitor changes in their breasts carefully to find cancer at an earlier, more treatable stage. (See “For women who are or may be at increased risk” in “Can breast cancer be prevented?”)

Mutations in tumor suppressor genes like the *BRCA* genes are considered “high-penetrance” because they often lead to cancer. Although many women with high-penetrance mutations develop cancer, most cases of cancer (including breast cancer) are not caused by this kind of mutation.

More often, low-penetrance mutations or gene variations are a factor in cancer development. Each of these may have a small individual effect on cancer development, but the overall effect on the population can be large because they are common, and people often are affected with more than one at the same time. The genes involved may affect things like hormone levels, metabolism or other things that interact with risk factors for breast cancer. These genes may be responsible for much of the risk of breast cancer that runs in families.

Acquired gene changes

Most DNA mutations related to breast cancer occur in breast cells during a woman's life rather than having been inherited. These *acquired* mutations of oncogenes and/or tumor suppressor genes may result from other factors, like radiation or cancer-causing chemicals. But so far, the causes of most acquired mutations that could lead to breast cancer are still unknown. Most breast cancers have several acquired gene mutations.

Tests to spot acquired gene changes may help doctors more accurately predict the outlook (prognosis) for some women with breast cancer. For example, tests can identify women whose breast cancer cells have too many copies of the *HER2* oncogene. These cancers tend to be more aggressive. At the same time, drugs have been developed that specifically target these cancers and improve outcomes for patients.

See *Genes and Cancer* for more information about how genes can affect cancer risk and treatment.

Can breast cancer be prevented?

There is no sure way to prevent breast cancer. But there are things you can do that might lower your risk, such as changing risk factors that you can control.

Health habits

Body weight, physical activity, and diet have all been linked to breast cancer, so these might be areas where you can take action. Read the *American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention* to learn more.

Medical options for women at increased risk

For women who have certain risk factors for breast cancer, such as a family history, there are a number of medical options that may help prevent breast cancer.

Drugs to reduce risk

For women at increased risk of breast cancer, drugs such as tamoxifen and raloxifene have been shown to reduce the risk, but these drugs can have their own risks and side effects. Other drugs, such as aromatase inhibitors, and dietary supplements that may help lower risk are also being studied. See *Medicines to Reduce Breast Cancer Risk* for more information.

Preventive surgery

If you have a strong family history of breast cancer, you can talk to your doctor about genetic testing for mutations in genes that increase the risk of breast cancer, such as the *BRCA* genes. If you have a genetic mutation or come from a family with a mutation but haven't been tested, you could consider surgery to lower your risk of cancer.

Can breast cancer be found early?

Tests and exams used to find a disease, like cancer, in people who do not have any symptoms are called screening tests. Screening exams, such as mammograms, find cancers before they start to cause symptoms. This is called early detection. Cancers that are found early – when they're small and haven't spread – are easier to treat and have better outcomes

Breast Cancer Prevention and Early Detection has more details about the American Cancer Society guidelines for the early detection of breast cancer.

Why is it important to find breast cancer early?

The earlier breast cancer is found, the better the chances that treatment will work. Breast cancers that are found because they can be felt tend to be larger and are more likely to have already spread outside the breast. But screening exams can often find breast cancers when they are small and still confined to the breast. The size of a breast cancer and how far it has spread are some of the most important factors in predicting the outlook (prognosis) of a woman with this disease.

Most doctors feel that early detection tests for breast cancer save thousands of lives each year. Many more lives probably could be saved if even more women and their health care providers took advantage of these tests.

Signs and symptoms of breast cancer

Knowing how your breasts normally look and feel is an important part of keeping up with your breast health. Finding breast cancer as early as possible gives you a better chance of successful treatment. But knowing what to look for does not take the place of having regular mammograms and other screening tests. Screening tests can help find breast cancer in its early stages, even before any symptoms appear.

The most common symptom of breast cancer is a new lump or mass. A painless, hard mass that has irregular edges is more likely to be cancerous, but breast cancers can be tender, soft, or rounded. They can even be painful. For this reason, it is important to have any new breast mass or lump or breast change checked by a health care professional experienced in diagnosing breast diseases.

Other possible symptoms of breast cancer include:

- Swelling of all or part of a breast (even if no distinct lump is felt)
- Skin irritation or dimpling
- Breast or nipple pain
- Nipple retraction (turning inward)
- Redness, scaliness, or thickening of the nipple or breast skin
- Nipple discharge (other than breast milk)

Sometimes a breast cancer can spread to lymph nodes under the arm or around the collar bone and cause a lump or swelling there, even before the original tumor in the breast tissue is large enough to be felt. Swollen lymph nodes should also be reported to your doctor.

Although any of these symptoms can be caused by things other than breast cancer, if you have them, they should be reported to your doctor so that he or she can find the cause.

Because mammograms do not find every breast cancer, it is important for you to be aware of changes in your breasts and to know the signs and symptoms of breast cancer.

How is breast cancer diagnosed?

Breast cancer is sometimes found after symptoms appear, but many women with early breast cancer have no symptoms. This is why getting the recommended screening tests (as described in "Can breast cancer be found early?") before any symptoms develop is so important.

If something suspicious is found during a screening exam, or if you have any of the symptoms of breast cancer described in the previous section, your doctor will use one or more methods to find out if the disease is present. If cancer is found, other tests will be done to determine the stage (extent) of the cancer.

Medical history and physical exam

If you think you have any signs or symptoms that might mean breast cancer, be sure to see your doctor as soon as possible. Your doctor will ask you questions about your symptoms, any other health problems, and possible risk factors for benign breast conditions or breast cancer.

Your breasts will be thoroughly examined for any lumps or suspicious areas and to feel their texture, size, and relationship to the skin and chest muscles. Any changes in the nipples or the skin of your breasts will be noted. The lymph nodes in your armpit and above your collarbones may be palpated (felt), because enlargement or firmness of these lymph nodes might indicate spread of breast cancer. Your doctor will also do a complete physical exam to judge your general health and whether there is any evidence of cancer that may have spread.

If breast symptoms and/or the results of your physical exam suggest breast cancer might be present, more tests will probably be done. These might include imaging tests, looking at samples of nipple discharge, or doing biopsies of suspicious areas.

Imaging tests used to evaluate breast disease

An imaging test is a way to see what's going on inside your body. The pictures can show normal body structures and functions, as well as abnormal ones caused by diseases like cancer.

These are some of the more common imaging tests used to look for or learn more about breast changes and breast cancer:

Mammograms

A mammogram is an x-ray of the breast. Screening mammograms are used to look for breast changes in women who have no signs or symptoms of a breast problem. Screening mammograms usually take 2 views (x-ray pictures taken from different angles) of each breast. Diagnostic mammograms are used to get a closer look of a change seen on a screening mammogram. More pictures are taken of the area that may be cancer.

See *Mammograms and Other Breast Imaging Tests* for more detailed information.

Breast ultrasound

Ultrasound, also known as *sonography*, uses sound waves to outline a part of the body. It's useful for looking at some breast changes, such as those that can be felt but not seen on a mammogram. It also helps tell the difference between fluid-filled cysts and solid masses.

See *Mammograms and Other Breast Imaging Tests* for more detailed information.

Magnetic resonance imaging (MRI) of the breast

MRIs use radio waves and strong magnets instead of x-rays. The energy from the radio waves is absorbed and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed picture. For breast MRI to look for cancer, a contrast liquid called *gadolinium* is injected into a vein before or during the scan to show details better.

See *Mammograms and Other Breast Imaging Tests* for more detailed information.

Ductogram (galactogram)

A ductogram, also called a galactogram, is sometimes used to help find the cause of any worrisome nipple discharge. In this test, a very thin metal tube is put into the opening of a duct in the nipple that the discharge is coming from. A small amount of contrast material is put in. It outlines the shape of the duct on x-ray and can show if there's a mass inside the duct. If fluid is coming from your nipple, some of the fluid may be collected and checked for signs of infection or cancer cells.

Biopsy procedures

A biopsy is done when mammograms, other imaging tests, or the physical exam shows a breast change that may be cancer. A biopsy is the only way to know for sure if it's cancer. For a biopsy, a sample (tiny piece) of the suspicious area is taken out and tested in the lab. The sample is called a biopsy specimen. See *For Women Facing a Breast Biopsy* for more information.

How is breast cancer classified?

After you have a biopsy, the samples of breast tissue are looked at in the lab to determine whether breast cancer is present and if so, what type it is. Certain lab tests may be done that can help determine how quickly a cancer is likely to grow and (to some extent) what treatments are likely to be effective. Sometimes these tests aren't done until the entire tumor is removed by either breast-conserving surgery or mastectomy.

If a benign condition is diagnosed, you will need no further treatment. Still, it is important to find out from your doctor if the benign condition puts you at higher risk for breast cancer in the future and what type of follow-up you might need.

If the diagnosis is cancer, there should be time for you to learn about the disease and to discuss treatment options with your cancer care team, friends, and family. It is usually not necessary to rush into treatment. You might want to get a second opinion before deciding what treatment is best for you.

Breast cancer type

The tissue removed during the biopsy (or during surgery) is first looked at under a microscope to see if cancer is present and whether it is a carcinoma or some other type of cancer (like a sarcoma). If there is enough tissue, the pathologist may be able to determine if the cancer is in situ (not invasive) or invasive. The biopsy is also used to determine the cancer's type, such as invasive ductal carcinoma or invasive lobular carcinoma. See "What is breast cancer?" for more about each type.

With an FNA (fine needle aspiration) biopsy, not as many cells are removed and they often become separated from the rest of the breast tissue, so it is often only possible to say that cancer cells are present without being able to say if the cancer is in situ or invasive.

The most common types of breast cancer, invasive ductal and invasive lobular cancer, generally are treated in the same way.

Breast cancer grade

A pathologist also assigns a grade to the cancer, which is based on how closely the biopsy sample looks like normal breast tissue and how rapidly the cancer cells are dividing. The grade can help predict a woman's prognosis. In general, a lower grade number indicates a slower-growing cancer that is *less* likely to spread, while a higher number indicates a faster-growing cancer that is *more* likely to spread. The tumor grade is one factor in deciding if further treatment is needed after surgery.

For invasive cancers, the histologic tumor grade is sometimes called the *Bloom-Richardson grade*, *Nottingham grade*, *Scarff-Bloom-Richardson grade*, or *Elston-Ellis grade*. Sometimes the grade is expressed with words instead of numbers:

- Grade 1 is the same as well differentiated
- Grade 2 is the same as moderately differentiated.
- Grade 3 is the same as poorly differentiated

Grade 3 cancers tend to grow and spread more quickly.

Understanding Your Pathology Report: Breast Cancer has more information about grading invasive cancers.

DCIS is also graded, but the grade is based only on how abnormal the cancer cells appear (nuclear grade). The presence of necrosis (areas of dead or dying cancer cells) is also noted. The term *comedocarcinoma* is often used to describe DCIS with prominent necrosis. If a breast duct is filled with a plug of dead and dying cells, the term *comedonecrosis* may be used. The terms *comedocarcinoma* and *comedonecrosis* are linked to a higher grade of DCIS.

Understanding Your Pathology Report: Ductal Carcinoma In Situ has more on grading DCIS.

Tests to classify breast cancers

Estrogen receptors (ER) and progesterone receptors (PR)

Receptors are proteins in or on certain cells that can attach to certain substances, such as hormones, that circulate in the blood. Normal breast cells and some breast cancer cells contain receptors that attach to estrogen and progesterone. These 2 hormones often fuel the growth of breast cancer cells.

An important step in evaluating a breast cancer is to test the cancer removed during the biopsy (or surgery) to see if it has estrogen and progesterone receptors. Cancer cells may have neither, one, or both of these receptors. Breast cancers that have estrogen receptors

are often referred to as *ER-positive* (or ER+) cancers, while those containing progesterone receptors are called *PR-positive* (or PR+) cancers.

All invasive breast cancers should be tested for both of these hormone receptors either on the biopsy sample or when they are removed with surgery. About 2 of 3 breast cancers have at least one of these receptors. This percentage is higher in older women than in younger women. DCIS should be checked for estrogen receptors, as well.

HER2/neu testing

About 1 of 5 breast cancers have too much of a growth-promoting protein called HER2/neu (often just shortened to HER2). The *HER2/neu* gene instructs the cells to make this protein. Tumors with increased levels of HER2/neu are referred to as *HER2-positive*.

Cancers that are HER2-positive have too many copies of the *HER2/neu gene*, resulting in greater than normal amounts of the HER2/neu protein. These cancers tend to grow and spread more aggressively than other breast cancers.

All newly diagnosed invasive breast cancers should be tested for HER2/neu because HER2-positive cancers are much more likely to benefit from treatment with drugs that target the HER2/neu protein, such as trastuzumab (Herceptin[®]) and lapatinib (Tykerb[®]). DCIS is not tested for HER2 because it is not treated with these drugs.

A biopsy or surgery sample is usually tested in 1 of 2 ways:

- Immunohistochemistry (IHC): In this test, special antibodies that identify the HER2/neu protein are applied to the sample, which cause cells to change color if many copies are present. This color change can be seen under a microscope. The test results are reported as 0, 1+, 2+, or 3+.
- Fluorescent in situ hybridization (FISH): This test uses fluorescent pieces of DNA that specifically stick to copies of the *HER2/neu* gene in cells, which can then be counted under a special microscope.

Many breast cancer specialists feel the FISH test is more accurate than IHC. However, it is more expensive and takes longer to get the results. Often the IHC test is used first. If the results are 1+ (or 0), the cancer is considered HER2-negative. People with HER2-negative tumors are not treated with drugs (like trastuzumab) that target HER2. If the test comes back 3+, the cancer is HER2-positive. Patients with HER2-positive tumors may be treated with drugs like trastuzumab. When the result is 2+, the HER2 status of the tumor is not clear. This usually leads to testing the tumor with FISH. Some institutions also use FISH to confirm HER2 status that is 3+ by IHC and some perform only FISH.

A newer type of test, known as *chromogenic in situ hybridization (CISH)*, works similarly to FISH, by using small DNA probes to count the number of *HER2* genes in

breast cancer cells. But this test looks for color changes (not fluorescence) and doesn't require a special microscope, which could make it less expensive. Right now, it is not being used as much as IHC or FISH.

Classifying breast cancer based on hormone receptors and HER2 status

Doctors often divide invasive breast cancers into groups based on the presence of hormone receptors (ER and PR) and whether or not the cancer has too much HER2.

Hormone receptor-positive: If the breast cancer cells contain either estrogen or progesterone receptors, they can be called hormone receptor-positive (or just hormone-positive). Breast cancers that are hormone receptor-positive can be treated with hormone therapy drugs that lower estrogen levels or block estrogen receptors. This includes cancers that are ER-negative but PR-positive. Hormone receptor-positive cancers tend to grow more slowly than those that are hormone receptor-negative (and don't have either estrogen or progesterone receptors). Women with these cancers tend to have a better outlook in the short-term, but cancers that are hormone receptor-positive can sometimes come back many years after treatment. Hormone receptor-positive cancers are more common in women after menopause.

Hormone receptor-negative: If the breast cancer cells don't have either estrogen or progesterone receptors, they are said to be hormone receptor-negative (or just hormone-negative). Treatment with hormone therapy drugs is not helpful for these cancers. These cancers tend to grow more quickly than hormone receptor-positive cancers. If they return after treatment, it is more often in the first few years. Hormone receptor-negative cancers are more common in women who have not yet gone through menopause.

HER2 positive: Cancers that have too much HER2 protein or extra copies of the HER2 gene are called HER2 positive. These cancers can be treated with drugs that target HER2.

HER2 negative: Cancers that don't have excess HER2 are called HER2 negative. These cancers do not respond to treatment with drugs that target HER2.

Triple-negative: If the breast cancer cells don't have estrogen or progesterone receptors and don't have too much HER2, they are called triple-negative. These cancers tend to occur more often in younger women and in women who are African-American or Hispanic/Latina. Triple-negative breast cancers tend to grow and spread more quickly than most other types of breast cancer. Because the tumor cells don't have hormone receptors, hormone therapy is not helpful in treating these cancers. Because they don't have too much HER2, drugs that target HER2 aren't helpful, either. Chemotherapy can still be useful, though.

Triple-positive: This term is used to describe cancers that are ER-positive, PR-positive, and have too much HER2. These cancers can be treated with hormone drugs as well as drugs that target HER2.

Other tests of breast cancers

Tests of ploidy and cell proliferation rate

The ploidy of cancer cells refers to the amount of DNA they contain. If there's a normal amount of DNA in the cells, they are said to be *diploid*. If the amount is abnormal, then the cells are described as *aneuploid*. Tests of ploidy may help determine prognosis, but they rarely change treatment and are considered optional. They are not usually recommended as part of a routine breast cancer work-up.

The *S-phase fraction* is the percentage of cells in a sample that are replicating (copying) their DNA. DNA replication means that the cell is getting ready to divide into 2 new cells. The rate of cancer cell division can also be estimated by a Ki-67 test. If the S-phase fraction or Ki-67 labeling index is high, it means that the cancer cells are dividing more rapidly, which indicates a more aggressive cancer.

Tests of gene patterns

Researchers have found that looking at the patterns of a number of different genes at the same time (sometimes referred to as *gene expression profiling*) can help predict whether or not an early-stage breast cancer is likely to come back after initial treatment. Two such tests, which look at different sets of genes, are now available: the Oncotype DX[®] and the MammaPrint[®]

Oncotype DX[®]: The Oncotype DX test can be helpful when deciding whether additional (adjuvant) treatment with chemotherapy (after surgery) might be useful in women with early-stage breast cancers that are hormone receptor-positive. This test is most often used for tumors that are small (1 cm or less) and have not spread to lymph nodes, but it can be used for more advanced tumors.

The test looks at a set of 21 genes in cells from tumor samples to determine a “recurrence score,” which is a number between 0 and 100:

- Cancers with a recurrence score of 17 or below have a low risk of recurrence (cancer coming back after treatment) if they are treated with hormone therapy. Women with these cancers would probably not benefit from chemotherapy.
- Cancers with a score of 18 to 30 are at intermediate risk of recurrence. Some women with these cancers might benefit from chemotherapy.
- Cancers with a score of 31 or more are at high risk of recurrence. Women with these cancers are likely to benefit from chemotherapy in addition to hormone therapy.

The test estimates risk and helps predict who would be likely to benefit from chemotherapy. Still, it cannot tell for certain if any particular woman will have a recurrence with or without chemotherapy. It is a tool that can be used, along with other

factors, to help guide women and their doctors when deciding whether more treatment might be useful.

MammaPrint®: This test can be used to help determine how likely breast cancers are to recur in a distant part of the body after initial treatment.

The test looks at the activity of 70 different genes to determine if the cancer is low risk or high risk. So far though, it hasn't been studied to see if the results are useful in guiding treatment.

Usefulness of these tests: Many doctors use these tests (along with other information) to help make decisions about offering chemotherapy, but they aren't needed in all cases. These tests are now being looked at further in large clinical trials. In the meantime, women might want to ask their doctors if these tests might be useful for them.

Classifying breast cancer based on gene expression

Research on patterns of gene expression has also suggested some newer ways to classify breast cancers. The current types of breast cancer are based largely on how tumors look under a microscope. A newer classification, based on molecular features, divides breast cancers into 4 groups. This testing, called the *PAM50*, is currently available but it isn't clear that it is any more helpful in guiding treatment than tests of hormone receptors and HER2:

Luminal A and luminal B types: The luminal types are estrogen receptor (ER)-positive. The gene expression patterns of these cancers are similar to normal cells that line the breast ducts and glands (the inside of a duct or gland is called its *lumen*). Luminal A cancers are low grade, tend to grow fairly slowly, and have the best prognosis. Luminal B cancers generally grow somewhat faster than luminal A cancers and their outlook is not as good.

HER2 type: These cancers have extra copies of the *HER2* gene and sometimes some others. They usually have a high-grade appearance under the microscope. These cancers tend to grow more quickly and have a worse prognosis, although they often can be treated successfully with targeted therapies aimed at HER2 which are often given along with chemotherapy.

Basal type: Most of these cancers are of the so-called *triple-negative* type, that is, they lack estrogen or progesterone receptors and have normal amounts of HER2. The gene expression patterns of these cancers are similar to cells in the deeper basal layers of breast ducts and glands. This type is more common among women with *BRCA1* gene mutations. For reasons that are not well understood, this cancer is also more common among younger and African-American women.

These are high-grade cancers that tend to grow quickly and have a poor outlook. Hormone therapy and anti-HER2 therapies like trastuzumab and lapatinib are not

effective against these cancers, although chemotherapy can be helpful. A great deal of research is being done to find better ways to treat these cancers.

It is hoped that these new breast cancer classifications might someday allow doctors to better tailor breast cancer treatments, but more research is needed in this area before this will be possible.

More on testing biopsy tissue to classify cancer

For more information on how biopsy tissue is looked at and tested by pathologists, see *Testing Biopsy and Cytology Specimens for Cancer*.

Tests for breast cancer spread

If you have been diagnosed with breast cancer, you might need more tests if your doctor thinks the cancer may have spread based on your symptoms, the results of your physical exam, or the size of your tumor.

Chest x-ray: This test may be done to see if the cancer has spread to your lungs.

Bone scan: This test can help show if the cancer has spread to your bones. It can show all of the bones of your body at the same time and can find small areas of cancer spread not seen on plain x-rays.

CT scan (computed tomography): A CT scan is a special type of x-ray. Pictures are taken from different angles and are combined by a computer to make detailed pictures of the organs. This test is most often used to look at the chest and/or belly (abdomen) to see if breast cancer has spread to other organs. It can also be used to guide a biopsy needle into an area of concern.

MRI (magnetic resonance imaging): An MRI scan takes pictures using radio waves and strong magnets instead of x-rays. This test can be helpful in looking at your brain and spinal cord. MRIs can be more uncomfortable than CT scans because they take longer and you need to lie in a narrow tube while the test is done.

Ultrasound: For this test, a wand that gives off sound waves is moved over the skin to take pictures of the inside of the body. A gel is often put on your skin first.

PET scan (positron emission tomography): This test uses a form of radioactive sugar. The sugar is put into a vein and travels throughout the body. Cancer cells absorb high amounts of this sugar. A special camera then takes pictures that show the areas where the sugar collected throughout the body.

How is breast cancer staged?

After a woman is diagnosed with breast cancer, doctors will figure out whether it has spread, and if so, how far. This is called *staging*. The stage of a cancer helps determine how serious the cancer is and how best to treat it.

What is staging?

Staging is the process of finding out how widespread the cancer is when it is found. The stage is the most important factor in deciding how to treat the cancer and determining how successful treatment might be.

To determine the cancer's stage after a breast cancer diagnosis, doctors must answer these questions:

- Is the cancer invasive or non-invasive?
- How big is the breast tumor? Has it grown into nearby areas?
- Has the cancer spread to nearby lymph nodes? If so, how many are involved?
- Has the cancer spread to other parts of the body?

Depending on the results of your physical exam and biopsy, you might need more tests to help determine the stage, such as a chest x-ray, mammograms of both breasts, bone scans, CT scans, MRI, and/or PET scans. Blood tests may also be done to evaluate your overall health or to check for spread to certain organs.

After looking at your test results, your doctor will tell you the stage of your cancer. The earliest stage cancers are called stage 0 (carcinoma in situ), and then range from stages I (1) through IV (4). Some of the stages are further divided into sub stages using the letters A, B, and C.

As a rule, the lower the number, the less the cancer has spread. A higher number, such as stage IV (4), means a more advanced cancer. And within a stage, an earlier letter means a lower (and often better) stage. Cancers with similar stages tend to have a similar outlook and are often treated in much the same way.

Understanding your breast cancer stage

Breast cancer is staged using the American Joint Committee on Cancer (AJCC) TNM system, which is based on:

- The size of the breast tumor (**T**) and if it has grown into nearby areas
- Whether the cancer has reached nearby lymph nodes (**N**)

- Whether the cancer has metastasized (spread to other parts of the body) (**M**)

Once the T, N, and M categories for your cancer have been determined, your doctor will combine the information to find the stage of the cancer. This process is called *stage grouping*. Cancers with similar stages tend to have a similar outlook and are often treated in a similar way.

Stage 0	Tis, N0, M0	<p>This is <i>ductal carcinoma in situ (DCIS)</i>, a pre-cancer of the breast. Many consider DCIS the earliest form of breast cancer. In DCIS, cancer cells are still within a duct and have not invaded deeper into the surrounding fatty breast tissue.</p> <p><i>Lobular carcinoma in situ (LCIS)</i> sometimes also is classified as stage 0 breast cancer, but most oncologists believe it is not a true cancer or pre-cancer.</p> <p>Paget disease of the nipple (without an underlying tumor mass) is also stage 0.</p> <p>In all cases the cancer has not spread to lymph nodes or distant sites.</p>
Stage IA	T1, N0, M0	<p>The tumor is 2 cm (about 3/4 of an inch) or less across (T1) and has not spread to lymph nodes (N0) or distant sites (M0).</p>
Stage IB	T0 or T1, N1mi, M0	<p>The tumor is 2 cm or less across (or is not found) (T0 or T1) with micrometastases in 1 to 3 axillary lymph nodes (the cancer in the underarm lymph nodes is greater than 0.2mm across and/or more than 200 cells but is not larger than 2 mm)(N1mi). The cancer has not spread to distant sites (M0).</p>

Stage IIA	T0 or T1, N1 (but not N1mi), M0:	<p>The tumor is 2 cm or less across (or is not found) (T1 or T0) and either:</p> <ul style="list-style-type: none"> • It has spread to 1 to 3 axillary (underarm) lymph nodes, with the cancer in the lymph nodes larger than 2 mm across (N1a), <p>OR</p> <ul style="list-style-type: none"> • Tiny amounts of cancer are found in internal mammary lymph nodes (nodes near the breast bone) on sentinel lymph node biopsy (N1b), <p>OR</p> <ul style="list-style-type: none"> • It has spread to 1 to 3 axillary lymph nodes and to internal mammary lymph nodes (found on sentinel lymph node biopsy) (N1c). <ul style="list-style-type: none"> • The cancer has not spread to distant sites (M0).
	OR	
	T2, N0, M0	<p>The tumor is larger than 2 cm but less than 5 cm (about 2 inches) across (T2) but hasn't spread to the lymph nodes (N0). The cancer has not spread to distant sites (M0).</p>
Stage IIB	T2, N1, M0	<p>The tumor is larger than 2 cm but less than 5 cm across (T2). It has spread to 1 to 3 axillary lymph nodes and/or tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1). The cancer hasn't spread to distant sites (M0).</p>

	OR	
	T3, N0, M0	The tumor is larger than 5 cm across but does not grow into the chest wall or skin (T3). The cancer has not spread to the lymph nodes (N0) or to distant sites (M0).
Stage IIIA	T0 to T2, N2, M0	The tumor is not more than 5 cm across (or cannot be found) (T0 to T2). It has spread to 4 to 9 axillary lymph nodes, or it has enlarged the internal mammary lymph nodes (N2). The cancer hasn't spread to distant sites (M0).
	OR	
	T3, N1 or N2, M0	The tumor is larger than 5 cm across but does not grow into the chest wall or skin (T3). It has spread to 1 to 9 axillary nodes, or to internal mammary nodes (N1 or N2). The cancer hasn't spread to distant sites (M0).
Stage IIIB	T4, N0 to N2, M0	<p>The tumor has grown into the chest wall or skin (T4), and one of the following applies:</p> <ul style="list-style-type: none"> • It has not spread to the lymph nodes (N0). • It has spread to 1 to 3 axillary lymph nodes and/or tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1). • It has spread to 4 to 9 axillary lymph nodes, or it has enlarged the internal mammary lymph nodes (N2).

		<p>The cancer hasn't spread to distant sites (M0).</p> <p>Inflammatory breast cancer is classified as T4d and is at least stage IIIB. If it has spread to many nearby lymph nodes (N3) it could be stage IIIC, and if it has spread to distant lymph nodes or organs (M1) it would be stage IV.</p>
<p>Stage IIIC</p>	<p>any T, N3, M0</p>	<p>The tumor is any size (or can't be found), and one of the following applies:</p> <ul style="list-style-type: none"> • Cancer has spread to 10 or more axillary lymph nodes (N3). • Cancer has spread to the lymph nodes under the collar bone (infraclavicular nodes) (N3). • Cancer has spread to the lymph nodes above the collar bone (supraclavicular nodes) (N3). • Cancer involves axillary lymph nodes and has enlarged the internal mammary lymph nodes (N3). • Cancer has spread to 4 or more axillary lymph nodes, and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N3). <p>The cancer hasn't spread to distant sites (M0).</p>
<p>Stage IV</p>	<p>any T, any N, M1</p>	<p>The cancer can be any size (any T) and may or may not have spread to nearby lymph nodes (any N). It has spread to distant organs or to lymph nodes far from the breast (M1). The most common sites of spread are the bones,</p>

		liver, brain, or lungs.
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The staging system in this chart uses the *pathologic stage*. It is based on the results of physical exam, biopsy, imaging tests, and the results of surgery, when the breast mass and nearby lymph nodes have been looked at under a microscope. This is likely to be more accurate than *clinical staging*, which only takes into account the tests done *before* surgery.

If you have any questions about the stage of your cancer and what it might mean in your case, be sure to ask your doctor.

Details of the TNM staging system

The TNM staging system classifies cancers based on 3 areas called the T, N, and M categories:

T (primary tumor) categories

The letter T followed by a number from 0 to 4 describes the main (primary) tumor's size and spread to the skin or to the chest wall under the breast. Higher T numbers mean a larger tumor and/or wider spread to tissues near the breast.

- **TX:** Primary tumor cannot be assessed.
- **T0:** No evidence of primary tumor.
- **Tis:** Carcinoma in situ (DCIS, LCIS, or Paget disease of the nipple with no associated tumor mass)
- **T1** (includes T1a, T1b, and T1c): Tumor is 2 cm (3/4 of an inch) or less across.
- **T2:** Tumor is more than 2 cm but not more than 5 cm (2 inches) across.
- **T3:** Tumor is more than 5 cm across.
- **T4** (includes T4a, T4b, T4c, and T4d): Tumor of any size growing into the chest wall or skin. This includes inflammatory breast cancer.

N (nearby lymph node) categories

The letter N followed by a number from 0 to 3 indicates whether the cancer has spread to lymph nodes near the breast and, if so, how many lymph nodes are affected.

Lymph node staging for breast cancer is based on how the nodes look under the microscope, and has changed as technology has evolved. Newer methods have made it

possible to find smaller and smaller deposits of cancer cells, but experts haven't been sure how much these tiny deposits of cancer cells affect outlook.

It's not yet clear how much cancer in the lymph node is needed to see a change in outlook or treatment. This is still being studied, but for now, a deposit of cancer cells must contain at least 200 cells or be at least 0.2 mm across (less than 1/100 of an inch) for it to change the N stage. An area of cancer spread that is smaller than 0.2 mm (or fewer than 200 cells) doesn't change the stage, but is recorded with abbreviations (i+ or mol+) that indicate the type of special test used to find the spread.

If the area of cancer spread is at least 0.2 mm (or 200 cells), but still not larger than 2 mm, it is called a *micrometastasis* (one mm is about the size of the width of a grain of rice). Micrometastases are counted only if there aren't any larger areas of cancer spread. Areas of cancer spread larger than 2 mm are known to affect outlook and do change the N stage. These larger areas are sometimes called *macrometastases*, but are more often just called *metastases*.

NX: Nearby lymph nodes cannot be assessed (for example, if they were removed previously).

N0: Cancer has not spread to nearby lymph nodes.

- **N0(i+):** The area of cancer spread contains less than 200 cells and is smaller than 0.2 mm. The abbreviation "i+" means that a small number of cancer cells (called *isolated tumor cells*) were seen in routine stains or when a special type of staining technique, called *immunohistochemistry*, was used.
- **N0(mol+):** Cancer cells cannot be seen in underarm lymph nodes (even using special stains), but traces of cancer cells were detected using a technique called *RT-PCR*. RT-PCR is a molecular test that can find very small numbers of cells. (This test is not often used for finding breast cancer cells in lymph nodes because the results do not influence treatment decisions.)

N1: Cancer has spread to 1 to 3 axillary (underarm) lymph node(s), and/or tiny amounts of cancer are found in internal mammary lymph nodes (those near the breast bone) on sentinel lymph node biopsy.

- **N1mi:** Micrometastases (tiny areas of cancer spread) in 1 to 3 lymph nodes under the arm. The areas of cancer spread in the lymph nodes are 2 mm or less across (but at least 200 cancer cells or 0.2mm across).
- **N1a:** Cancer has spread to 1 to 3 lymph nodes under the arm with at least one area of cancer spread greater than 2 mm across.
- **N1b:** Cancer has spread to internal mammary lymph nodes, but this spread could only be found on sentinel lymph node biopsy (it did not cause the lymph nodes to become enlarged).

- **N1c:** Both N1a and N1b apply.

N2: Cancer has spread to 4 to 9 lymph nodes under the arm, or cancer has enlarged the internal mammary lymph nodes (either N2a or N2b, but not both).

- **N2a:** Cancer has spread to 4 to 9 lymph nodes under the arm, with at least one area of cancer spread larger than 2 mm.
- **N2b:** Cancer has spread to one or more internal mammary lymph nodes, causing them to become enlarged.

N3: Any of the following:

N3a: either:

- Cancer has spread to 10 or more axillary lymph nodes, with at least one area of cancer spread greater than 2mm, OR
- Cancer has spread to the lymph nodes under the collar bone (infraclavicular nodes), with at least one area of cancer spread greater than 2mm.

N3b: either:

- Cancer is found in at least one axillary lymph node (with at least one area of cancer spread greater than 2 mm) and has enlarged the internal mammary lymph nodes, OR
- Cancer has spread to 4 or more axillary lymph nodes (with at least one area of cancer spread greater than 2 mm), and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy.

N3c: Cancer has spread to the lymph nodes above the collar bone (supraclavicular nodes) with at least one area of cancer spread greater than 2mm.

M (metastasis) categories

The letter M followed by a 0 or 1 indicates whether the cancer has spread to distant organs -- for example, the lungs or bones.

MX: Distant spread (metastasis) cannot be assessed.

M0: No distant spread is found on x-rays (or other imaging tests) or by physical exam.

- **cM0(i+):** Small numbers of cancer cells are found in blood or bone marrow (found only by special tests), or tiny areas of cancer spread (no larger than 0.2 mm) are found in lymph nodes away from the breast.

M1: Cancer has spread to distant organs (most often to the bones, lungs, brain, or liver).

Breast cancer survival rates, by stage

Survival rates tell you what portion of people with the same type and stage of cancer are still alive a certain amount of time (usually 5 years) after they were diagnosed. They can't tell you how long you will live, but they may help give you a better understanding about how likely it is that your treatment will be successful. Some people will want to know the survival rates for their cancer type and stage, and some people won't. If you don't want to know, you don't have to.

Survival rates are often used by doctors as a standard way of discussing a person's outlook (prognosis). Some women with breast cancer might want to know the survival statistics for people in similar situations, while others might not find the numbers helpful, or might even not want to know them.

What is a 5-year survival rate?

Statistics on the outlook for a certain type and stage of cancer are often given as 5-year survival rates, but many people live longer – often much longer – than 5 years. The *5-year survival rate* is the percentage of people who live *at least* 5 years after being diagnosed with cancer. For example, a 5-year survival rate of 90% means that an estimated 90 out of 100 people who have that cancer are still alive 5 years after being diagnosed. Keep in mind, however, that many of these people live much longer than 5 years after diagnosis.

Relative survival rates are a more accurate way to estimate the effect of cancer on survival. These rates compare women with breast cancer to women in the overall population. For example, if the 5-year relative survival rate for a specific type of cancer is 90%, it means that people who have that cancer are, on average, about 90% as likely as people who don't have that cancer to live for at least 5 years after being diagnosed.

But remember, the 5-year relative survival rates are estimates – your outlook can vary based on a number of factors specific to you.

Survival rates don't tell the whole story

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they can't predict what will happen in any particular person's case. There are a number of limitations to remember:

- The numbers below are among the most current available. But to get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. As treatments are improving over time, women who are now being diagnosed with breast cancer may have a better outlook than these statistics show.

- The available statistics for breast cancer do not divide survival rates by all of the substages, such as IA and IB. The rates for these substages are likely to be close to the rate for the overall stage. For example, the survival rate for stage IA is likely to be slightly higher than that listed for stage I, while the survival rate for stage IB would be expected to be slightly lower.
- These statistics are based on the stage of the cancer when it was first diagnosed. They do not apply to cancers that later come back or spread, for example.
- Many other factors affect a person's outlook, such as age and health, the presence of hormone receptors on the cancer cells, the treatment received, and how well the cancer responds to treatment.

Your doctor can tell you how these numbers may apply to you, as he or she is familiar with your particular situation.

5-year relative survival rates for breast cancer by stage

The outlook for women with breast cancer varies by the stage (extent) of the cancer. In general, the survival rates are higher for women with earlier stage cancers. But remember, the outlook for each woman is specific to her circumstances.

- The 5-year relative survival rate for women with stage 0 or stage I breast cancer is close to 100%.
- For women with stage II breast cancer, the 5-year relative survival rate is about 93%.
- The 5-year relative survival rate for stage III breast cancers is about 72%. But often, women with these breast cancers can be successfully treated.
- Breast cancers that have spread to other parts of the body are more difficult to treat and tend to have a poorer outlook. Metastatic, or stage IV breast cancers, have a 5-year relative survival rate of about 22%. Still, there are often many treatment options available for women with this stage of breast cancer.

Remember, these survival rates are only estimates – they can't predict what will happen to any individual person. We understand that these statistics can be confusing and may lead you to have more questions. Talk to your doctor to better understand your specific situation.

Please note that these statistics come from the National Cancer Institute's SEER database. They are based on the previous version of AJCC staging. In that version stage II also included patients that would now be considered stage IB.

How is breast cancer treated?

If you've been diagnosed with breast cancer, your cancer care team will discuss treatment options with you. It's important that you take time to think about your choices. You will want to weigh the benefits of each treatment option against the possible risks and side effects.

Which treatments are used for breast cancer?

There are several ways to treat breast cancer, depending on its type and stage.

Local treatments: Some treatments are called *local therapies*, meaning they treat the tumor without affecting the rest of the body. Types of local therapy used for breast cancer include:

- Surgery
- Radiation therapy

These treatments are more likely to be useful for earlier stage (less advanced) cancers, although they might also be used in some other situations.

Systemic treatments: Breast cancer can also be treated using drugs, which can be given by mouth or directly into the bloodstream. These are called *systemic therapies* because they can reach cancer cells anywhere in the body. Depending on the type of breast cancer, several different types of drugs might be used, including:

- Chemotherapy
- Hormone therapy
- Targeted therapy

Many women will get more than one type of treatment for their cancer.

How is breast cancer typically treated?

Most women with breast cancer will have some type of surgery to remove the tumor. Depending on the type of breast cancer and how advanced it is, you may need other types of treatment as well, either before or after surgery, or sometimes both. Surgery is less likely to be a main part of the treatment for more advanced breast cancers.

Typical treatment plans are based on the type of breast cancer, its stage, and any special situations:

- Non-invasive breast cancer (DCIS or LCIS)

- Invasive breast cancer (Stages I-IV)
- Breast cancer during pregnancy

Your treatment plan will depend on other factors as well, including your overall health and personal preferences.

Who treats breast cancer?

Doctors on your cancer treatment team might include:

- A breast surgeon: a doctor who uses surgery to treat breast cancer
- A radiation oncologist: a doctor who uses radiation to treat cancer
- A medical oncologist: a doctor who uses chemotherapy and other medicines to treat cancer

Many other specialists might be part of your treatment team as well, including physician assistants, nurse practitioners, nurses, psychologists, social workers, nutritionists, and other health professionals. See *Health Professionals Associated With Cancer Care* for more on this.

Making treatment decisions

It's important to discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. It's also very important to ask questions if there is anything you're not sure about. See "What should you ask your cancer care team about breast cancer?" for ideas.

Getting a second opinion

You may also want to get a second opinion. This can give you more information and help you feel more certain about the treatment plan you choose. If you aren't sure where to go for a second opinion, ask your doctor for help. See *Seeking a Second Opinion* for more information.

Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service at 1-800-303-5691 for a list of studies that meet your medical needs, or see the Clinical Trials section to learn more.

Considering complementary and alternative methods

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your cancer or relieve symptoms. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods refer to treatments that are used along with your regular medical care. Alternative treatments are used instead of a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be dangerous.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision. See the Complementary and Alternative Medicine section to learn more.

Choosing to stop treatment or choosing no treatment at all

For some people, when treatments have been tried and are no longer controlling the cancer, it could be time to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are still things you can do to help maintain or improve your quality of life. Learn more in *If Cancer Treatments Stop Working*.

Some people, especially if the cancer is advanced, might not want to be treated at all. There are many reasons you might decide not to get cancer treatment, but it's important to talk this through with your doctors before you make that decision. Remember that even if you choose not to treat the cancer, you can still get supportive care to help with pain or other symptoms.

Help getting through cancer treatment

Your cancer care team will be your first source of information and support, but there are other resources for help when you need it. Hospital- or clinic-based support services are an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has programs and services – including rides to treatment, lodging, support groups, and more – to help you get through treatment. Call

our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists on call 24 hours a day, every day.

The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Surgery for breast cancer

Most women with breast cancer have some type of surgery as part of their treatment. Depending on the situation, surgery may be done for different reasons. For example, surgery may be done to:

- Remove as much of the cancer as possible (breast-conserving surgery or mastectomy)
- Find out whether the cancer has spread to the lymph nodes under the arm (sentinel lymph node biopsy or axillary lymph node dissection)
- Restore the breast's shape after the cancer is removed (breast reconstruction)
- Relieve symptoms of advanced cancer

Surgery to remove breast cancer

There are two main types of surgery to remove breast cancer:

- **Breast-conserving surgery** (also called a *lumpectomy*, *quadrantectomy*, *partial mastectomy*, or *segmental mastectomy*) – in which only the part of the breast containing the cancer is removed. The goal is to remove the cancer as well as some surrounding normal tissue. How much of the breast is removed depends on the size and location of the tumor and other factors. (See “Breast-conserving surgery (lumpectomy).”)
- **Mastectomy** – in which the entire breast is removed, including all of the breast tissue and sometimes other nearby tissues. There are several different types of mastectomies. Some women may also get a double mastectomy, in which both breasts are removed. (See “Mastectomy.”)

Choosing between breast-conserving surgery and mastectomy

Many women with early-stage cancers can choose between breast-conserving surgery (BCS) and mastectomy. The main advantage of BCS is that a woman keeps most of her

breast. But in most cases she will also need radiation. Women who have mastectomy for early-stage cancers are less likely to need radiation.

For some women, mastectomy may clearly be a better option, because of the type of breast cancer, the large size of the tumor, previous treatment history, or certain other factors.

Surgery to remove nearby lymph nodes

To find out if the breast cancer has spread to axillary (underarm) lymph nodes, one or more of these lymph nodes will be removed and looked at under the microscope. This is an important part of figuring out the stage (extent) of the cancer. Lymph nodes can be removed either as part of the surgery to remove the breast cancer or in a separate operation. To learn more about these procedures and when they might be done, see “Lymph node surgery for breast cancer.”

Breast reconstruction after surgery

After having a mastectomy (or some breast-conserving surgeries), a woman might want to consider having the breast mound rebuilt to restore the breast’s appearance after surgery. This is called breast reconstruction.

There are several types of reconstructive surgery, although your options may depend on your medical situation and personal preferences. You may have a choice between having breast reconstruction at the same time as the mastectomy (immediate reconstruction) or at a later time (delayed reconstruction).

If you are thinking about having reconstructive surgery, it’s a good idea to discuss it with your breast surgeon and a plastic surgeon before your mastectomy. This gives the surgical team time to plan out the treatment options that might be best for you, even if you wait and have the reconstructive surgery later.

To learn about different breast reconstruction options, see *Breast Reconstruction After Mastectomy*.

Surgery for advanced breast cancer

Although surgery is very unlikely to cure breast cancer that has spread to other parts of the body, it can still be helpful in some situations, either as a way to slow the spread of the cancer, or to help prevent or relieve symptoms from it. For example, surgery might be used:

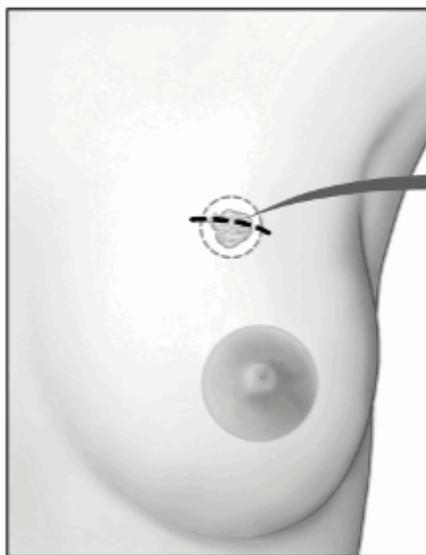
- When the breast tumor is causing an open wound in the breast (or chest)

- To treat a small number of areas of cancer spread (metastases) in a certain part of the body, such as the brain
- When an area of cancer spread is pressing on the spinal cord
- To treat a blockage in the liver
- To provide relief of pain or other symptoms

If your doctor recommends surgery for advanced breast cancer, it's important that you understand its goal—whether it's to cure the cancer or to prevent or treat symptoms.

Breast-conserving surgery (lumpectomy)

Breast-conserving surgery is sometimes called *lumpectomy*, *quadrantectomy*, *partial mastectomy*, or *segmental mastectomy*. In this surgery, only the part of the breast containing the cancer is removed. The goal is to remove the cancer as well as some surrounding normal tissue. How much of the breast is removed depends on the size and location of the tumor and other factors.



The tumor is removed with a rim of normal breast tissue.



Postoperative appearance depends on the amount of tissue removed, but there will be a small scar and often an indentation in the breast.

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Lumpectomy/partial mastectomy

Who can get breast-conserving surgery?

Breast-conserving surgery (BCS) is a good option for many women with early-stage cancers. The main advantage is that a woman keeps most of her breast. However, she will in most cases also need radiation therapy. Women who have their entire breast removed (mastectomy) for early-stage cancers are less likely to need radiation.

Most women and their doctors prefer BCS and radiation therapy when it's a reasonable option. BCS might be a good option if you:

- Are very concerned about losing your breast
- Are willing to have radiation therapy and able to get to the appointments
- Have not already had the breast treated with radiation therapy or BCS
- Have only one area of cancer on the breast, or multiple areas that are close enough together to be removed without changing the look of the breast too much
- Have a small tumor (5 cm [2 inches] or smaller), and a tumor that is small relative to your breast size
- Are not pregnant or, if pregnant, will not need radiation therapy immediately (to avoid risking harm to the fetus)
- Do not have a genetic factor such as a *BRCA* mutation, which might increase your chance of a second cancer
- Do not have certain serious connective tissue diseases such as scleroderma or lupus, which may make you especially sensitive to the side effects of radiation therapy
- Do not have inflammatory breast cancer

Some women might be worried that having a less extensive surgery might raise their risk of the cancer coming back. But the fact is that in most cases, mastectomy does not give you any better chance of long-term survival or a better outcome from treatment. Studies following thousands of women for more than 20 years show that when BCS can be done, having mastectomy instead does not provide any better chance of survival.

Will I need breast reconstruction surgery after breast-conserving surgery?

Before your surgery, talk to your breast surgeon about how breast-conserving surgery might change the look of your breast. The larger the portion of breast removed, the more likely it is that you will see a change in the shape of the breast afterward. If your breasts look very different after surgery, it may be possible to have some type of reconstructive surgery or to have the size of the unaffected breast reduced to make the breasts more

symmetrical. It may even be possible to have this done during the initial surgery. It's very important to talk with your doctor (and possibly a plastic surgeon) **before** surgery to get an idea of how your breasts are likely to look afterward, and to learn what your options might be.

Recovering from breast-conserving surgery: What to expect

This type of surgery is usually done in an outpatient surgery center, and an overnight stay in the hospital is usually not needed. Most women can return to their regular activities within 2 weeks.

Ask a member of your health care team how to care for your surgery site and arm. Usually, you and your caregivers will get written instructions about care after surgery. These instructions should include:

- How to care for the surgery site and dressing
- How to care for your drain, if you have one (This is a plastic or rubber tube coming out of the surgery site that removes the fluid that collects during healing.)
- How to recognize signs of infection
- Bathing and showering after surgery
- When to call the doctor or nurse
- When to start using the arm again and how to do arm exercises to prevent stiffness
- When to start wearing a bra again
- What to eat and not to eat
- Use of medicines, including pain medicines and possibly antibiotics
- Any restrictions on activity
- What to expect regarding sensations or numbness in the breast and arm
- What to expect regarding feelings about body image
- When to see your doctor for a follow-up appointment
- Referral to a Reach To Recovery volunteer. Through our Reach To Recovery program, a specially trained volunteer who has had breast cancer can provide information, comfort, and support.

How can the doctors be sure all of the cancer was removed?

During the surgery, the surgeon will try to remove all of the cancer, plus some surrounding normal tissue.

After surgery is complete, a doctor called a pathologist will use a microscope to look at the tissue that was removed. If the pathologist finds no cancer cells at any of the edges of the removed tissue, it is said to have *negative* or *clear margins*. But if cancer cells are found at the edges of the tissue, it is said to have *positive margins*.

The presence of positive margins means that some cancer cells may have been left behind after surgery, so the surgeon may need to go back and remove more tissue. This operation is called a *re-excision*. If the surgeon can't remove enough breast tissue to get clear surgical margins, a mastectomy may be needed.

The distance from the tumor to the margin is also important. Even if the margins are “clear,” they could be “close”—meaning the distance between the edge of the tumor and edge of the tissue removed is too small and more surgery may be needed. Surgeons sometimes disagree on what is an adequate (or good) margin.

Will more treatment be needed after breast-conserving surgery?

Most women will need radiation therapy to the breast after breast-conserving surgery. Sometimes, to make it easier to aim the radiation, small metallic clips (which will show up on x-rays) may be placed inside the breast during surgery to mark the area.

Many women receive hormone therapy after surgery to help lower the risk of the cancer coming back. Some women might also need chemotherapy after surgery. If so, radiation therapy is usually delayed until the chemotherapy is completed.

Side effects of breast-conserving surgery

Side effects of breast-conserving surgery can include:

- Pain or tenderness
- Temporary swelling
- Hard scar tissue that forms in the surgical site
- Change in the shape of the breast
- Nerve (neuropathic) pain in the chest wall, armpit, and/or arm that doesn't go away over time (called post-mastectomy pain syndrome or PMPS)

As with all operations, bleeding and infection at the surgery site are also possible. If axillary lymph nodes are also removed, other side effects such as lymphedema may occur.

Mastectomy

Mastectomy is surgery to remove the entire breast. All of the breast tissue is removed, sometimes along with other nearby tissues.

Types of mastectomies

There are several different types of mastectomies, based on how the surgery is done and how much additional tissue is removed.

Simple (or total) mastectomy

Simple mastectomy is the most common type of mastectomy used to treat breast cancer. In this procedure, the surgeon removes the entire breast, including the nipple, but does not remove underarm lymph nodes or muscle tissue from beneath the breast. (Sometimes lymph nodes are removed in a different procedure during the same surgery.) Most women, if they are hospitalized, can go home the next day.

Double mastectomy

If a mastectomy is done on both breasts, it is called a double (or bilateral) mastectomy. When this is done, it is often as preventive surgery for women at very high risk for getting cancer in the other breast, such as those with a *BRCA* gene mutation.

Skin-sparing mastectomy

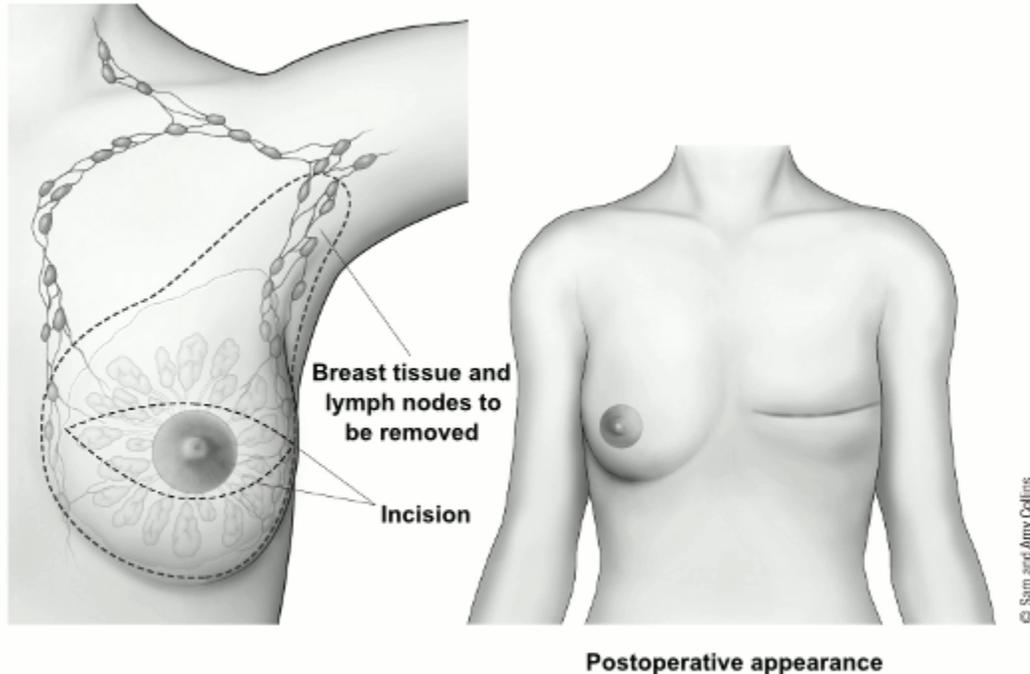
For some women considering immediate reconstruction, a skin-sparing mastectomy can be done. In this procedure, most of the skin over the breast (other than the nipple and areola) is left intact. This can work as well as a simple mastectomy. The amount of breast tissue removed is the same as with a simple mastectomy.

Implants or tissue from other parts of the body are used to reconstruct the breast.

Skin-sparing mastectomy may not be suitable for larger tumors or those that are close to the surface of the skin. This approach has not been used for as long as the more standard type of mastectomy, but many women prefer it because it offers the advantage of less scar tissue and a reconstructed breast that seems more natural.

Modified radical mastectomy

A modified radical mastectomy combines a simple mastectomy with the removal of the lymph nodes under the arm (called an *axillary lymph node dissection*).



Modified radical mastectomy

Nipple-sparing mastectomy

Nipple-sparing mastectomy is a variation of the skin-sparing mastectomy. It is more often an option for women who have a small, early-stage cancer near the outer part of the breast, with no signs of cancer in the skin or near the nipple. (Cancer cells are more likely to be hidden in the nipple if the breast tumor is larger or close to the nipple, which means there is a higher risk the cancer will come back if the nipple is not removed.)

In this procedure, the breast tissue is removed, but the breast skin and nipple are left in place. This is followed by breast reconstruction. The surgeon often removes the breast tissue beneath the nipple (and areola) during the procedure to check for cancer cells. If cancer is found in this tissue, the nipple must be removed. Even when no cancer is found under the nipple, some doctors give the nipple tissue a dose of radiation during or after the surgery to try to reduce the risk of the cancer coming back.

There are still some problems with nipple-sparing surgeries. Afterward, the nipple does not have a good blood supply, so sometimes it can wither away or become deformed.

Because the nerves are also cut, there is little or no feeling left in the nipple. For women with larger breasts, the nipple may look out of place after the breast is reconstructed. As a result, many doctors feel that this surgery is best done in women with small to medium sized breasts. This procedure leaves less visible scars, but if it isn't done properly, it can leave behind more breast tissue than other forms of mastectomy. This could result in a higher risk of cancer developing than for a skin-sparing or simple mastectomy. This was more of a problem in the past, but improvements in technique have helped make this surgery safer. Still, many experts do not yet consider nipple-sparing procedures too risky to be a standard treatment for breast cancer.

Radical mastectomy

In this extensive operation, the surgeon removes the entire breast, axillary (underarm) lymph nodes, and the pectoral (chest wall) muscles under the breast. This surgery was once very common, but less extensive surgery (such as modified radical mastectomy) has been found to be just as effective and with fewer side effects, so this surgery is rarely done now. This operation may still be done for large tumors that are growing into the pectoral muscles.

Who should get a mastectomy?

Many women with early-stage cancers can choose between breast-conserving surgery (BCS) and mastectomy. You may have an initial gut preference for mastectomy as a way to "take it all out as quickly as possible." But the fact is that in most cases, mastectomy does not give you any better chance of long-term survival or a better outcome from treatment. Studies following thousands of women for more than 20 years show that when BCS can be done, doing mastectomy instead does not provide any better chance of survival.

Although most women and their doctors prefer BCS (with radiation therapy) when it's a reasonable option, there are cases where mastectomy is likely to be the best choice. For example, mastectomy might be recommended if you:

- Are unable to have radiation therapy, or would prefer a more extensive surgery to having radiation therapy
- Have already had the breast treated with radiation therapy
- Have already had BCS along with re-excision(s) that have not completely removed the cancer
- Have two or more areas of cancer in the same breast that are not close enough together to be removed without changing the look of the breast too much

- Have a larger tumor (greater than 5 cm [2 inches] across), or a tumor that is large relative to your breast size
- Are pregnant and would need radiation therapy while still pregnant (risking harm to the fetus)
- Have a genetic factor such as a *BRCA* mutation, which might increase your chance of a second cancer
- Have certain serious connective tissue diseases such as scleroderma or lupus, which may make you especially sensitive to the side effects of radiation therapy
- Have inflammatory breast cancer

For women who are worried about breast cancer recurrence, it is important to understand that having a mastectomy instead of breast-conserving surgery plus radiation *only* lowers your risk of developing a second breast cancer in the same breast. It does not lower the chance of the cancer coming back in other parts of the body.

Should I have breast reconstruction surgery after mastectomy?

After having a mastectomy a woman might want to consider having the breast mound rebuilt to restore the breast's appearance after surgery. This is called *breast reconstruction*. Although each case is different, most mastectomy patients can have reconstruction. Reconstruction can be done at the same time as the mastectomy or years later.

If you are thinking about having reconstructive surgery, it's a good idea to discuss it with your surgeon and a plastic surgeon **before** your mastectomy. This allows the surgical teams to plan the treatment that's best for you, even if you wait and have the reconstructive surgery later. Insurance companies typically cover breast reconstruction, but you should check with your insurance company so you know what is covered.

Some women choose not to have reconstruction surgery. Wearing a breast prosthesis (breast form) is another option for women who want to have the contour of a breast under their clothes without having surgery. Some women are also comfortable with just 'going flat' if both breasts were removed.

Recovering from a mastectomy: What to expect

In general, women having a mastectomy stay in the hospital for 1 or 2 nights and then go home. However, some women may be placed in a 23-hour, short-stay observation unit before going home. How long it takes to recover from surgery depends on what procedures were done. Most women can return to their regular activities within 4 weeks.

Recovery time is longer if breast reconstruction was done as well, and it can take months to return to full activity after some procedures.

Ask a member of your health care team how to care for your surgery site and arm. Usually, you and your caregivers will get written instructions about care after surgery. These instructions should include:

- How to care for the surgery site and dressing
- How to care for your drain, if you have one (this is a plastic or rubber tube coming out of the surgery site that removes the fluid that collects during healing)
- How to recognize signs of infection
- Bathing and showering after surgery
- When to call the doctor or nurse
- When to start using the arm again and how to do arm exercises to prevent stiffness
- When to start wearing a bra again
- When to begin using a prosthesis and what type to use
- What to eat and not to eat
- Use of medicines, including pain medicines and possibly antibiotics
- Any restrictions on activity
- What to expect regarding sensations or numbness in the breast and arm
- What to expect regarding feelings about body image
- When to see your doctor for a follow-up appointment
- Referral to a Reach To Recovery volunteer. Through our Reach To Recovery program, a specially trained volunteer who has had breast cancer can provide information, comfort, and support.

Will more treatment be needed after mastectomy?

Some women might get other treatments after a mastectomy, such as radiation therapy, hormone therapy, chemotherapy, or targeted therapy. Talk to your doctor about what to expect.

Side effects of mastectomy

To some extent, the side effects of mastectomy can depend on the type of mastectomy you have (with more extensive surgeries tending to have more side effects). Side effects can include:

- Pain or tenderness
- Swelling at the surgery site
- Buildup of blood in the wound (hematoma)
- Buildup of clear fluid in the wound (seroma)
- Limited arm or shoulder movement
- Numbness in the chest or upper arm
- Nerve (neuropathic) pain in the chest wall, armpit, and/or arm that doesn't go away over time (called post-mastectomy pain syndrome or PMPS)

As with all operations, bleeding and infection at the surgery site are also possible. If axillary lymph nodes are also removed, other side effects such as lymphedema may occur.

Lymph node surgery for breast cancer

If you have been diagnosed with breast cancer, it's important to find out how far the cancer has spread. To help find out if the cancer has spread beyond the breast, one or more of the lymph nodes under the arm (axillary lymph nodes) are removed and checked under a microscope. This is an important part of staging. When the lymph nodes contain cancer cells, there is a higher chance that cancer cells have also spread to other parts of the body. Treatment decisions will often depend on whether cancer is found in the lymph nodes.

Lymph node removal can be done in different ways, depending on whether any lymph nodes are enlarged, how big the breast tumor is, and other factors.

Biopsy of an enlarged lymph node

If any of the lymph nodes under the arm or around the collar bone are swollen, they may be checked for cancer spread directly with a needle biopsy (either a fine needle aspiration biopsy or a core needle biopsy). Less often, the enlarged node is removed with surgery. If cancer is found in the lymph node, more nodes will need to be removed during an axillary lymph node dissection (described below).

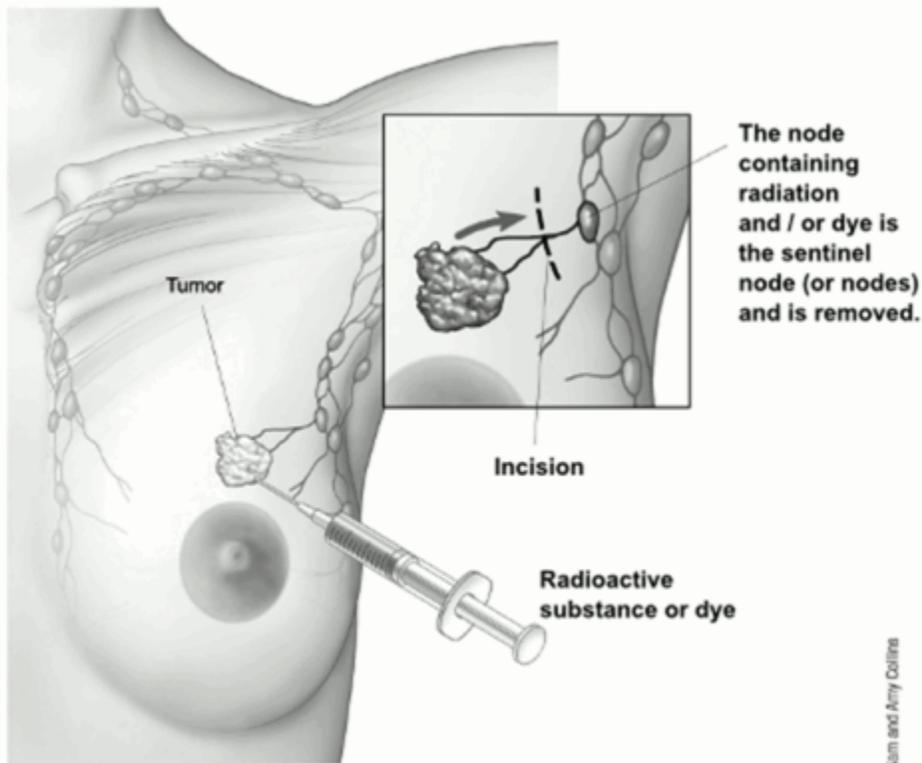
Types of lymph node surgery

Even if the nearby lymph nodes are not enlarged, they will still need to be checked for cancer. This can be done in two different ways. Sentinel lymph node biopsy is the most common and least invasive way, but in some cases a more extensive axillary lymph node dissection might be needed.

Lymph node surgery is often done as part of the main surgery to remove the breast cancer, but in some cases it might be done as a separate operation.

Sentinel lymph node biopsy (SLNB)

In a sentinel lymph node biopsy (SLNB), the surgeon finds and removes the first lymph node(s) to which a tumor is likely to spread (called the *sentinel nodes*). To do this, the surgeon injects a radioactive substance and/or a blue dye into the tumor, the area around it, or the area around the nipple. Lymphatic vessels will carry these substances along the same path that the cancer would be likely to take. The first lymph node(s) the dye or radioactive substance travels to will be the sentinel node(s).



Sentinel lymph node biopsy

After the substance has been injected, the sentinel node(s) can be found either by using a special device to detect radioactivity in the nodes that the radioactive substance flows into, or by looking for lymph nodes that have turned blue. To double check, both methods are often used. The surgeon cuts the skin over the area and removes the node(s) containing the dye or radiation.

The removed lymph nodes (often 2 or 3 nodes) are then checked closely for cancer cells by a doctor called a *pathologist*. This is sometimes done during the surgery. This way, if cancer is found in the sentinel lymph node(s), the surgeon may do a full axillary dissection (ALND) to remove more lymph nodes. If no cancer cells are seen in the node(s) at the time of the surgery, or if the sentinel node(s) are not checked by a pathologist at the time of the surgery, they will be examined more closely over the next several days.

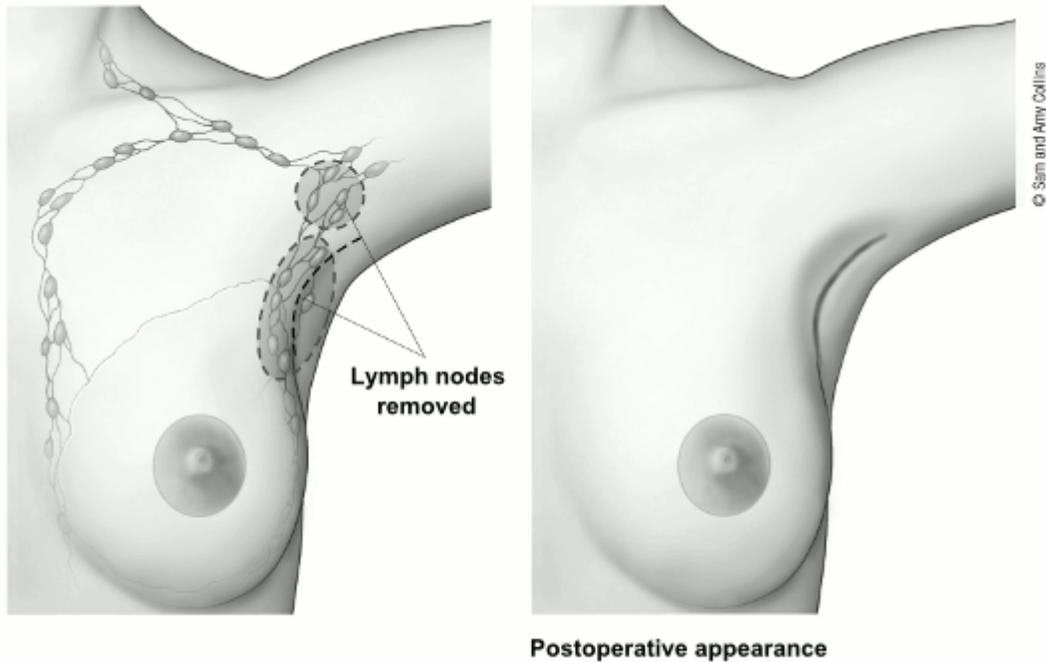
If cancer is found in the sentinel node(s) later, the surgeon may recommend a full ALND at a later time to check more nodes for cancer. Recently, however, studies have shown that in some cases it may be just as safe to leave the rest of the lymph nodes behind. This is based on certain factors, such as the size of the breast tumor, what type of surgery is used to remove the tumor, and what treatment is planned after surgery. Based on the studies that have looked at this, skipping the ALND may be an option for women with tumors 5 cm (2 inches) or smaller who are having breast-conserving surgery followed by radiation. Because this hasn't been studied well in women who have had mastectomy, it isn't clear that skipping the ALND would be safe for them.

If there is no cancer in the sentinel node(s), it's very unlikely that the cancer has spread to other lymph nodes, so no further lymph node surgery is needed.

Although SLNB has become a common procedure, it requires a great deal of skill. It should be done only by a surgeon who has experience with this technique. If you are thinking about having this type of biopsy, ask your health care team if they do them regularly.

Axillary lymph node dissection (ALND)

In this procedure, anywhere from about 10 to 40 (though usually less than 20) lymph nodes are removed from the area under the arm (axilla) and checked for cancer spread. ALND is usually done at the same time as a mastectomy or breast-conserving surgery (BCS), but it can be done in a second operation. This was once the most common way to check to see if breast cancer had spread to nearby lymph nodes, and it is still sometimes needed. For example, an ALND may be done if a previous biopsy has shown one or more of the underarm lymph nodes have cancer cells.



Axillary lymph node dissection

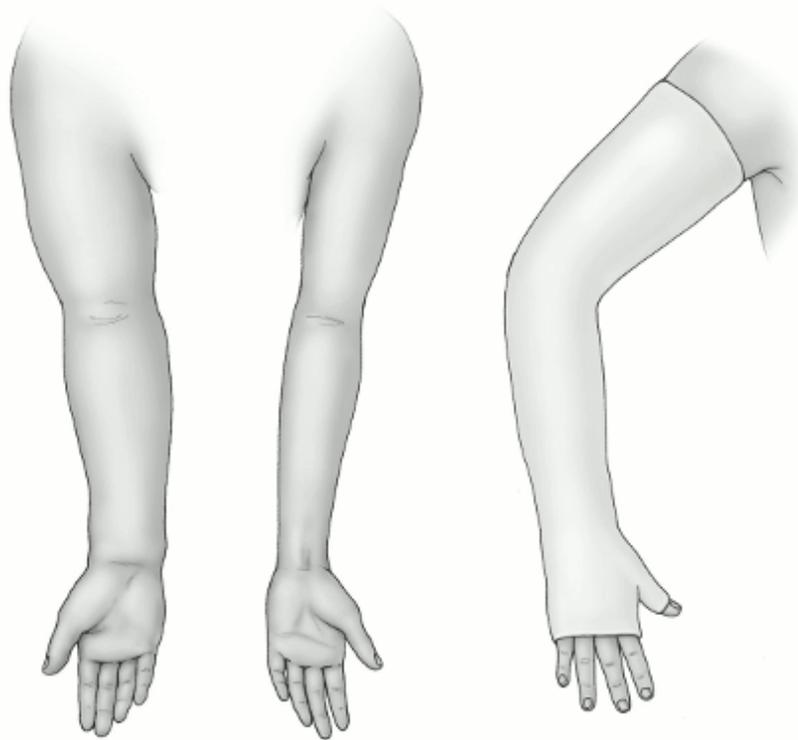
Side effects of lymph node surgery

As with any operation, **pain**, **swelling**, **bleeding**, **blood clots**, and **infection** are possible.

Lymphedema

A possible long-term effect of lymph node surgery is swelling in the arm or chest called **lymphedema**. Because any excess fluid in the arms normally travels back into the bloodstream through the lymphatic system, removing the lymph nodes sometimes blocks

drainage from the arm, causing this fluid to build up.



Left, an arm showing lymphedema swelling beside an unaffected arm. Right, a compression garment used to help control lymphedema.

© Sam and Amy Collins

This is less common after a sentinel lymph node biopsy (SLNB) than an axillary lymph node dissection (ALND).

Up to 30% of women who have ALND develop lymphedema. It also occurs in up to 3% of women who have SLNB. It may be more common if radiation is given after surgery. Sometimes the swelling lasts for only a few weeks and then goes away. Other times, it lasts a long time. If your arm is swollen, tight, or painful after lymph node surgery, be sure to tell someone on your cancer care team right away.

Limited arm and shoulder movement

You might also have **limited movement in your arm and shoulder** after surgery. This is more common after ALND than SLNB. Your doctor may give you exercises to help keep you from having permanent problems (a frozen shoulder).

Some women notice a rope-like structure that begins under the arm and can extend down toward the elbow. This is sometimes called **axillary web syndrome** or **lymphatic cording**. It is more common after ALND than SLNB. Symptoms may not appear for weeks or even months after surgery. It can cause pain and limit movement of the arm and

shoulder. This often goes away without treatment, although some women may find physical therapy helpful.

Numbness

Numbness of the skin on the upper, inner arm is another common side effect because the nerve that controls sensation here travels through the lymph node area.

Radiation therapy for breast cancer

Some women with breast cancer will need radiation, often in addition to other treatments. The need for radiation depends on what type of surgery you had, whether your cancer has spread to the lymph nodes or somewhere else in your body, and in some cases, your age. You may have just one type of radiation, or a combination of different types.

Radiation therapy is treatment with high-energy rays (such as x-rays) or particles that destroy cancer cells. There are 2 main types of radiation therapy that can be used to treat breast cancer:

- **External beam radiation:** This type of radiation comes from a machine outside the body.
- **Internal radiation (brachytherapy):** For this treatment, a radioactive source is put inside the body for a short time.

When might radiation therapy be used?

Women with breast cancer may be treated with radiation in several situations:

- After breast-conserving surgery (BCS), to help lower the chance that the cancer will come back in the breast or nearby lymph nodes
- After a mastectomy if the cancer was larger than 5 cm (about 2 inches), or when cancer is found in the lymph nodes
- If cancer has spread to other parts of the body, such as the bones or brain

External beam radiation

This is the most common type of radiation therapy for women with breast cancer. The radiation is focused from a machine outside the body on the area affected by the cancer.

Which areas need radiation depends on whether mastectomy or breast-conserving surgery (BCS) was done and whether or not lymph nodes are involved.

- If you had a mastectomy and no lymph nodes had cancer, radiation is targeted at the chest wall and the places where any drains exited the body after surgery.
- If you had BCS, you will most likely have radiation on the entire breast, and an extra boost of radiation to the area in the breast where the cancer was removed to help prevent it from coming back in that area. The boost is often given after the treatments to the whole breast have ended. It uses the same machine, but the beams are aimed at the place where the cancer was removed. Most women don't notice different side effects from boost radiation than from whole breast radiation.
- If cancer was found in the lymph nodes under the arm (axillary lymph nodes), radiation may be given to this area as well. In some cases, the area treated may also include the nodes above the collarbone (supraclavicular lymph nodes) and the nodes beneath the breast bone in the center of the chest (internal mammary lymph nodes).

When will I get radiation therapy?

If you will need external radiation therapy after surgery, it is usually not started until the tissues have been able to heal, often a month or longer. If you are getting chemotherapy as well, radiation treatments are usually delayed until chemotherapy is complete.

Preparing for external beam radiation therapy

Before your treatments start, the radiation team will take careful measurements to figure out the correct angles for aiming the radiation beams and the proper dose of radiation. They will make some ink marks or small tattoos on your skin to be used as a guide to focus the radiation on the right area. Check with your health care team whether the marks they use will be permanent.

Lotions, powders, deodorants, and antiperspirants can interfere with external beam radiation therapy, so your health care team may tell you not to use them until treatments are complete.

External radiation therapy is much like getting an x-ray, but the radiation is stronger. The procedure itself is painless. Each treatment lasts only a few minutes, but the setup time—getting you into place for treatment—usually takes longer.

Types and schedules of external beam radiation

The traditional schedule for getting breast radiation has been 5 days a week (Monday through Friday) for about 5 to 6 weeks. But many doctors are now using *accelerated breast irradiation* to give larger doses over a shorter time. There are several different types of accelerated breast irradiation:

- **Hypofractionated radiation therapy:** In this approach, radiation is given in larger doses using fewer treatments – typically for only 3 weeks. In women treated with breast conserving surgery (BCS) and without cancer spread to underarm lymph nodes, this schedule has been shown to be just as good at keeping the cancer from coming back in the same breast as giving the radiation over 5 weeks. It might also lead to fewer short-term side effects. Newer approaches now being studied give radiation over an even shorter period of time. In one approach, larger doses of radiation are given each day, but the course of radiation is shortened to only 5 days.
- **Intraoperative radiation therapy (IORT):** In this approach, a single large dose of radiation is given in the operating room right after BCS (before the breast incision is closed). IORT requires special equipment and is not widely available.
- **3D-conformal radiotherapy:** In this technique, the radiation is given with special machines so that it is better aimed at the area where the tumor was. This allows more of the healthy breast to be spared. Treatments are given twice a day for 5 days. Because only part of the breast is treated, this is considered to be a form of accelerated *partial* breast irradiation. (Other forms of accelerated partial breast irradiation are described under “Brachytherapy.”)

Researchers hope these approaches will prove to be at least equal to the current, standard radiation therapy methods, but few studies have compared them directly to standard radiation therapy. It is not known if all of the newer methods will have the same long-term results as standard radiation, so not all doctors use them. Women who are interested in these approaches may want to ask their doctor about taking part in clinical trials of accelerated breast irradiation now going on.

Possible side effects of external radiation

The main short-term side effects of external beam radiation therapy to the breast are:

- Swelling and heaviness in the breast
- Skin changes in the treated area
- Fatigue

Skin changes can range from mild redness to blistering and peeling. Your health care team may advise you to avoid exposing the treated skin to the sun because it may make the skin changes worse. Most skin changes get better within a few months. Changes to the breast tissue usually go away in 6 to 12 months, but it can take longer.

External beam radiation therapy can also cause side effects later on:

- Some women may find that radiation therapy causes the breast to become smaller and firmer.

- Radiation may affect your options for breast reconstruction later on. It can also raise the risk of problems if it's given after reconstruction, especially tissue flap procedures.
- Women who have had breast radiation may have problems breastfeeding later on.
- Radiation to the breast can sometimes damage some of the nerves to the arm. This is called *brachial plexopathy* and can lead to numbness, pain, and weakness in the shoulder, arm and hand.
- Radiation to the underarm lymph nodes can cause lymphedema, a type of pain and swelling in the arm or chest.
- In rare cases, radiation therapy may weaken the ribs, which could lead to a fracture.
- In the past, parts of the lungs and heart were more likely to get some radiation, which could lead to long-term damage of these organs in some women. But modern radiation therapy equipment allows doctors to better focus the radiation beams, so these problems are rare today.
- A very rare complication of radiation to the breast is the development of another cancer called *angiosarcoma*. These rare cancers can grow and spread quickly.

Brachytherapy

Brachytherapy, also known as *internal radiation*, is another way to deliver radiation therapy. Instead of aiming radiation beams from outside the body, a device containing radioactive seeds or pellets is placed into the breast tissue in the area where the cancer had been for a short time.

For women who had breast conserving surgery (BCS), brachytherapy can be used along with external beam radiation as a way to add an extra boost of radiation to the tumor site. It may also be used by itself (instead of radiation to the whole breast) as a form of *accelerated partial breast irradiation*. Tumor size, location, and other factors may limit who can get brachytherapy.

Types of brachytherapy

There are different types of brachytherapy:

- **Interstitial brachytherapy:** In this approach, several small, hollow tubes called *catheters* are inserted into the breast around the area where the cancer was removed and are left in place for several days. Radioactive pellets are inserted into the catheters for short periods of time each day and then removed. This method of brachytherapy has been around longer (and has more evidence to support it), but it is not used as much anymore.

- **Intracavitary brachytherapy:** This is the most common type of brachytherapy for women with breast cancer. A device is put into the space left from BCS and is left in place until treatment is complete. There are several different devices that can be used, including MammoSite®, SAVI®, Axxent®, and Contura®. They all go into the breast as a small catheter (tube). The end of the device inside the breast is then expanded so that it stays securely in the right place for the entire treatment. The other end of the catheter sticks out of the breast. For each treatment, one or more sources of radiation (often pellets) is placed down through the tube and into the device for a short time and then removed. Treatments are typically given twice a day for 5 days as an outpatient. After the last treatment, the device is collapsed down again and removed.

Early studies of intracavitary brachytherapy as the only radiation after BCS have had promising results, but they didn't directly compare this technique with standard whole breast external beam radiation.

One study that compared outcomes after BCS found that women treated with brachytherapy were more likely to go on to get a mastectomy of the treated breast (most likely because cancer was found again in that breast). The overall risk was still low, however, with about 4% of the women in the brachytherapy group needing mastectomy versus only 2% of the women in the whole breast radiation group. More studies comparing the 2 approaches are needed to see if brachytherapy should be used instead of whole breast radiation.

Possible side effects of intracavitary brachytherapy

As with external beam radiation, intracavitary brachytherapy can have side effects, including:

- Redness
- Bruising
- Breast pain
- Infection
- Break-down of an area of fat tissue in the breast
- Weakness and fracture of the ribs in rare cases

For more information about radiation therapy, see the Radiation Therapy section of our website.

Chemotherapy for breast cancer

Some women with breast cancer will get chemotherapy. Chemotherapy treats a woman's whole body for breast cancer, not just her breast. Many different side effects are possible from taking chemotherapy drugs, but not all women get the same ones.

Chemotherapy (*chemo*) is treatment with cancer-killing drugs that may be given intravenously (injected into a vein) or by mouth. The drugs travel through the bloodstream to reach cancer cells in most parts of the body.

When is chemotherapy used?

Not all women with breast cancer will need chemo, but there are several situations in which chemo may be recommended:

- **After surgery (adjuvant chemotherapy):** When chemo is given after breast surgery, it is called *adjuvant chemotherapy*. Surgery is used to remove all of the cancer that can be seen, but adjuvant chemo is used to try to kill any cancer cells that may have been left behind or spread but can't be seen, even on imaging tests. If these cells were allowed to grow, they could form new tumors in other places in the body. Adjuvant chemo can reduce the risk of breast cancer coming back.
- **Before surgery (neoadjuvant chemotherapy):** In neoadjuvant chemotherapy, you get the treatments before surgery instead of after. In terms of survival and the cancer coming back, there is no difference between getting chemo before or after surgery. But neoadjuvant chemo can have some benefits. First, chemo may shrink the tumor so that it can be removed with less extensive surgery. Because of this, neoadjuvant chemo is often used to treat cancers that are too big to be removed at the time of diagnosis (called *locally advanced* cancer). Also, by giving chemo before the tumor is removed, doctors can better see how the cancer responds to it. If the first set of chemo drugs does not shrink the tumor, your doctor will know that other drugs are needed.
- **For advanced breast cancer:** Chemo can be used as the main treatment for women whose cancer has spread outside the breast and underarm area, either when it is diagnosed or after initial treatments. The length of treatment depends on whether the cancer shrinks, how much it shrinks, and how well you tolerate the chemo.

Which chemotherapy drugs are used for breast cancer?

In most cases (especially as adjuvant or neoadjuvant treatment), chemo is most effective when combinations of more than one drug are used. Today, doctors use many different combinations, and it's not clear that any single combination is clearly the best.

The most common drugs used for adjuvant and neoadjuvant chemo include:

- Anthracyclines, such as doxorubicin (Adriamycin®) and epirubicin (Ellence®)
- Taxanes, such as paclitaxel (Taxol®) and docetaxel (Taxotere®)
- 5-fluorouracil (5-FU)
- Cyclophosphamide (Cytosan®)
- Carboplatin (Paraplatin®)

Most often, combinations of 2 or 3 of these drugs are used together.

Chemotherapy for advanced breast cancer

Chemo drugs useful in treating women with breast cancer that has spread, include:

- Docetaxel
- Paclitaxel
- Platinum agents (cisplatin, carboplatin)
- Vinorelbine (Navelbine®)
- Capecitabine (Xeloda®)
- Liposomal doxorubicin (Doxil®)
- Gemcitabine (Gemzar®)
- Mitoxantrone (Novantrone®)
- Ixabepilone (Ixempra®)
- Albumin-bound paclitaxel (nab-paclitaxel or Abraxane®)
- Eribulin (Halaven®)

Although drug combinations are often used to treat early breast cancer, advanced breast cancer is more often treated with single chemo drugs. Still, some combinations, such as carboplatin or cisplatin plus gemcitabine are commonly used to treat advanced breast cancer.

One or more drugs that target HER2 may be used with chemo for tumors that are HER2-positive (See “Targeted therapy for breast cancer” for more information about these drugs.)

How is chemotherapy given?

Chemo drugs for breast cancer are typically given into a vein (IV), either as an injection over a few minutes or as an infusion over a longer period of time. This can be done in a doctor’s office, chemotherapy clinic, or in a hospital setting.

Chemo is given in cycles, with each period of treatment followed by a rest period to give the body time to recover from the effects of the drugs. Cycles are most often 2 or 3 weeks long. Chemo begins on the first day of each cycle, but the schedule varies depending on the drugs used. For example, with some drugs, the chemo is given only on the first day of the cycle. With others, it is given for a few days in a row, or once a week. Then, at the end of the cycle, the chemo schedule repeats to start the next cycle.

Adjuvant and neoadjuvant chemo is often given for a total of 3 to 6 months, depending on the drugs that are used. Treatment may be longer for advanced breast cancer and is based on how well it is working and what side effects you have.

Dose-dense chemotherapy

Doctors have found that giving the cycles of certain chemo drugs closer together can lower the chance that the cancer will come back and improve survival for some women. For example, a drug that would normally be given every 3 weeks might be given every 2 weeks. This approach can be used for neoadjuvant and adjuvant treatment. It can lead to more problems with low blood cell counts, so it's not an option for all women.

Possible side effects of chemo for breast cancer

Chemo drugs can cause side effects, depending on the type and dose of drugs given, and the length of treatment. Some of the most common possible side effects include:

- Hair loss and nail changes
- Mouth sores
- Loss of appetite or increased appetite
- Nausea and vomiting

Chemo can affect the blood-forming cells of the bone marrow, which can lead to:

- Increased chance of infections (from low white blood cell counts)
- Easy bruising or bleeding (from low blood platelet counts)
- Fatigue (from low red blood cell counts and other reasons)
- Diarrhea

These side effects usually go away after treatment is finished. It's important to tell your health care team if you have any side effects, as there are often ways to lessen them. For example, drugs can be given to help prevent or reduce nausea and vomiting.

Other side effects are also possible. Some of these are more common with certain chemo drugs. Ask your cancer care team about the possible side effects of the specific drugs you are getting.

Nerve damage (neuropathy)

Many drugs used to treat breast cancer, including the taxanes (docetaxel and paclitaxel), platinum agents (carboplatin, cisplatin), vinorelbine, eribulin, and ixabepilone, can damage nerves outside of the brain and spinal cord. This can sometimes lead to symptoms (mainly in the hands and feet) like numbness, pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. In most cases this goes away once treatment is stopped, but it might last a long time in some women. (See *Peripheral Neuropathy Caused By Chemotherapy*.)

Hand-foot syndrome

Certain chemo drugs, such as capecitabine and liposomal doxorubicin, can irritate the palms of the hands and the soles of the feet. This is called *hand-foot syndrome*. Early symptoms include numbness, tingling, and redness. If it gets worse, the hands and feet can become swollen and uncomfortable or even painful. The skin may blister, leading to peeling or even open sores. There is no specific treatment, although some creams may help. These symptoms gradually get better when the drug is stopped or the dose is lowered. The best way to prevent severe hand-foot syndrome is to tell your doctor when early symptoms come up, so that the drug dose can be changed.

Chemo brain

Another possible side effect of chemo is "chemo brain." Many women who are treated for breast cancer report a slight decrease in mental functioning. They may have some problems with concentration and memory, which may last a long time. Although many women have linked this to chemo, it also has been seen in women who did not get chemo as part of their treatment. Still, most women function well after treatment. In studies that have found chemo brain to be a side effect of treatment, the symptoms most often last for a few years. (See *Chemo Brain*.)

Feeling unwell or tired (fatigue)

Many women do not feel as healthy after receiving chemo as they did before. There is often a residual feeling of body pain or achiness and a mild loss of physical functioning. These may be very subtle changes that happen slowly over time.

Fatigue is another common problem for women who have received chemo. This may last up to several years. It can often be helped, so it's important to let your doctor or nurse know about it. Exercise, naps, and conserving energy may be recommended. If you have

sleep problems, they can be treated. Sometimes women become depressed, which may be helped by counseling and/or medicines. (See *Fatigue*.)

Heart damage

Doxorubicin, epirubicin, and some other chemo drugs may cause permanent heart damage (called *cardiomyopathy*). The risk is highest if the drug is used for a long time or in high doses.

Most doctors will check your heart function with a test like a MUGA or an echocardiogram (an ultrasound of the heart) before starting one of these drugs. They also carefully control the doses, watch for symptoms of heart problems, and may repeat the heart test during treatment. If the heart function begins to decline, treatment with these drugs will be stopped. Still, in some people, signs might not appear until months or years after treatment stops. Heart damage from these drugs happens more often if other drugs that can cause heart damage, such as drugs that target HER2, are used as well, so doctors are more cautious when these drugs are used together.

Menstrual changes and fertility issues

For younger women, changes in menstrual periods are a common side effect of chemo. Premature menopause (not having any more menstrual periods) and infertility (not being able to become pregnant) may occur and may be permanent. Some chemo drugs are more likely to cause this than others. The older a woman is when she gets chemotherapy, the more likely it is that she will go through menopause or become infertile as a result. When this happens, there is an increased risk of bone loss and osteoporosis. There are medicines that can treat or help prevent problems with bone loss.

Even if your periods have stopped while you are on chemo, you may still be able to get pregnant. Getting pregnant while on chemo could lead to birth defects and interfere with treatment. If you are pre-menopausal before treatment and are sexually active, it's important to discuss using birth control with your doctor. For women with hormone receptor-positive breast cancer, some types of hormonal birth control (like birth control pills) are not a good idea, so it's important to talk with both your oncologist and your gynecologist (or family doctor) about what options would be best in your case. Women who have finished treatment (like chemo) can safely go on to have children, but it's not safe to get pregnant while on treatment.

If you are pregnant when you get breast cancer, you still can be treated. Certain chemo drugs can be taken safely during the last 2 trimesters of pregnancy. (See "Treatment of breast cancer during pregnancy.")

If you think you might want to have children after being treated for breast cancer, talk with your doctor before you start treatment. (See *Fertility and Women With Cancer*.)

Increased risk of leukemia

Very rarely, certain chemo drugs can cause diseases of the bone marrow, such as *myelodysplastic syndrome* or even acute myeloid leukemia, a life-threatening cancer of white blood cells. When this happens it is usually within 10 years after treatment. For most women, the benefits of chemo in helping prevent breast cancer from coming back or in extending life are likely to far exceed the risk of this rare but serious complication.

For more information about chemotherapy, see the Chemotherapy section of our website.

Hormone therapy for breast cancer

Some types of breast cancer are affected by hormones in the blood. ER-positive and PR-positive breast cancer cells have receptors that attach to estrogen, which helps them grow. There are several drugs that use different ways to stop estrogen from attaching to the receptors.

Hormone therapy is a form of systemic therapy, meaning it reaches cancer cells anywhere in the body and not just in the breast. It is recommended for women with hormone receptor-positive (ER-positive and/or PR-positive) breast cancers, but it does not help women whose tumors are hormone receptor-negative (both ER- and PR-negative).

When might hormone therapy be used?

Hormone therapy is most often used after surgery (as adjuvant therapy) to help reduce the risk of the cancer coming back, but it can be started before surgery (as neoadjuvant treatment) as well. It is usually used for at least 5 years.

Hormone therapy can also be used to treat cancer that has come back after treatment or that has spread to other parts of the body.

How does hormone therapy work?

About 2 out of 3 breast cancers are hormone receptor-positive. Their cells have receptors that attach to the hormones estrogen (ER-positive cancers) and/or progesterone (PR-positive cancers). For these cancers, high estrogen levels help the cancer cells grow and spread.

There are several different types of hormone therapy that use different ways to keep estrogen from helping the cancer grow. Most types of hormone therapy for breast cancer either lower estrogen levels or stop estrogen from acting on breast cancer cells.

Drugs that block estrogen

These drugs work by stopping estrogen from affecting breast cancer cells.

Tamoxifen

This drug blocks estrogen receptors in breast cancer cells. This stops estrogen from binding to the cancer cells and telling them to grow and divide. While tamoxifen acts like an anti-estrogen in breast cells, it acts like an estrogen in other tissues, like the uterus and the bones. Because of this, it is called a *selective estrogen receptor modulator* (SERM).

Tamoxifen can be used in several ways:

- For women with hormone receptor-positive breast cancer treated with surgery, tamoxifen can help lower the chances of the cancer coming back and raise the chances of living longer. It can also lower the risk of getting a new cancer in the other breast. Tamoxifen can be started either after surgery (adjuvant therapy) or before surgery (neoadjuvant therapy) and is usually taken for 5 to 10 years. For early stage breast cancer, this drug is mainly used for women who have not yet gone through menopause. (If you have gone through menopause, aromatase inhibitors are usually used instead.)
- For women who have been treated for ductal carcinoma in situ (DCIS) that is hormone receptor-positive, taking tamoxifen for 5 years lowers the chance of the DCIS coming back. It also lowers the chance of getting an invasive breast cancer.
- For women with hormone-positive breast cancer that has spread to other parts of the body, tamoxifen can often help slow or stop the growth of the cancer, and might even shrink some tumors.
- In women at high risk of breast cancer, tamoxifen can be used to help lower the risk of developing breast cancer.

Toremifene (Fareston) is another SERM that works in a similar way, but it is used less often and is only approved to treat metastatic breast cancer. It is not likely to work if tamoxifen has already been used and has stopped working.

These drugs are taken by mouth, most often as a pill.

The most common side effects of tamoxifen and toremifene are:

- Fatigue
- Hot flashes
- Vaginal dryness or discharge
- Mood swings

Some women with cancer spread to the bones may have a "tumor flare" with pain and swelling in the muscles and bones. This usually subsides quickly, but in some rare cases a woman may also develop a high calcium level in the blood that is hard to control. If this happens, the treatment may need to be stopped for a time.

Rare, but more serious side effects are also possible:

- These drugs can increase the risk of developing cancers of the uterus (endometrial cancer and uterine sarcoma) in women who have gone through menopause. Tell your doctor right away about any unusual vaginal bleeding (a common symptom of both of these cancers). Most uterine bleeding is not from cancer, but this symptom always needs prompt attention.
- Blood clots are another possible serious side effect. They usually form in the legs (called *deep vein thrombosis* or DVT), but sometimes a piece of clot may break off and end up blocking an artery in the lungs (*pulmonary embolism* or PE). Call your doctor or nurse right away if you develop pain, redness, or swelling in your lower leg (calf), shortness of breath, or chest pain, because these can be symptoms of a DVT or PE.
- Rarely, tamoxifen has been associated with strokes in post-menopausal women, so tell your doctor if you have severe headaches, confusion, or trouble speaking or moving.
- These drugs might also increase the risk of a heart attack.

Depending on a woman's menopausal status, tamoxifen can have different effects on the bones. In pre-menopausal women, tamoxifen can cause some bone thinning, but in post-menopausal women it is often good for bone strength.

The benefits of taking these drugs outweigh the risks for almost all women with hormone receptor-positive breast cancer.

Fulvestrant (Faslodex[®])

Fulvestrant is a drug that blocks estrogen receptors and also eliminates them temporarily. This drug is not a SERM – it acts like an anti-estrogen throughout the body.

Fulvestrant is used to treat metastatic breast cancer, most often after other hormone drugs (like tamoxifen and often an aromatase inhibitor) have stopped working.

It is given by injections into the buttocks. For the first month, the shots are given 2 weeks apart. After that, they are given once a month.

Common short-term side effects can include:

- Hot flashes

- Night sweats
- Mild nausea
- Fatigue

Because fulvestrant blocks estrogen, in theory it could cause weakened bones (osteoporosis) if it is taken for a long time.

Fulvestrant is currently approved only for use in post-menopausal women. It is sometimes used “off-label” in pre-menopausal women, often combined with a luteinizing-hormone releasing hormone (LHRH) agonist to turn off the ovaries (see the section on ovarian ablation below).

Treatments to lower estrogen levels

Some hormone treatments work by lowering the estrogen levels in the body. Because estrogen encourages hormone receptor-positive breast cancers to grow, lowering the estrogen level can help slow the cancer’s growth or help prevent it from coming back.

Aromatase inhibitors (AIs)

Aromatase inhibitors (AIs) are drugs that stop estrogen production. Before menopause, most estrogen is made by the ovaries. But for women whose ovaries aren’t working, either due to menopause or certain treatments, a small amount of estrogen is still made by an enzyme (called *aromatase*) in the fat tissue. AIs work by blocking aromatase from making estrogen.

These drugs are most useful in women who are past menopause, although they can also be used in premenopausal women if combined with ovarian ablation (see below).

There are three AIs that all seem to work about equally well in treating breast cancer:

- Letrozole (Femara)
- Anastrozole (Arimidex)
- Exemestane (Aromasin)

These drugs are taken daily as pills.

Use in adjuvant therapy: After surgery, taking an AI, either alone or after tamoxifen, has been shown to work better than taking just tamoxifen for 5 years to reduce the risk of the cancer coming back later.

Schedules that are known to be helpful include:

- Tamoxifen for 2 to 3 years, followed by an AI to complete 5 years of treatment
- Tamoxifen for 5 years, followed by an AI for 5 years
- An AI for at least 5 years

For most post-menopausal women whose cancers are hormone receptor-positive, most doctors recommend taking an AI at some point during adjuvant therapy. Right now, standard treatment is to take these drugs for about 5 years (or alternate with tamoxifen for a total of at least 5 years). Studies are now being done to see if taking an AI for more than 5 years would be more helpful.

If you have early-stage breast cancer and had not gone through menopause when you were first diagnosed, your doctor might recommend taking tamoxifen first, and then taking an AI later if you go through menopause during treatment. Another option is taking a drug called a luteinizing hormone-releasing hormone (LHRH) analog, which turns off the ovaries, along with an AI.

Use in cancer that comes back or has spread: AIs can also be used to treat more advanced hormone-positive breast cancers, especially in post-menopausal women. They are often continued for as long as they are helpful.

Possible side effects: The AIs tend to have fewer serious side effects than tamoxifen. They don't cause uterine cancers and very rarely cause blood clots. They can, however, cause muscle pain and joint stiffness and/or pain. The joint pain may be similar to a feeling of having arthritis in many different joints at one time. This side effect may improve by switching to a different AI, but it has led some women to stop treatment. If this happens, most doctors recommend using tamoxifen to complete 5 years of hormone treatment.

Because AIs remove all estrogens from women after menopause, they also cause bone thinning, sometimes leading to osteoporosis and even fractures. If you are taking an AI, you may also be given medicine to strengthen your bones, such as bisphosphonates or denosumab.

Ovarian ablation

For pre-menopausal women, removing or shutting down the ovaries (ovarian ablation), which are the main source of estrogens, effectively makes them post-menopausal. This may allow some other hormone therapies, such as AIs, to work better. Ovarian ablation is most often done to treat metastatic breast cancer, but it can also be used in some women with early-stage disease.

There are several ways to remove or shut down the ovaries:

- **Oophorectomy:** Surgery is done to remove the ovaries. This is a form of permanent ovarian ablation.
- **Luteinizing hormone-releasing hormone (LHRH) analogs:** These drugs are used more often than oophorectomy. They stop the signal that the body sends to ovaries to make estrogen, which causes temporary menopause. Common LHRH drugs include goserelin (Zoladex®) and leuprolide (Lupron®). They can be used alone or with

other hormone drugs (tamoxifen, aromatase inhibitors, fulvestrant) as hormone therapy in pre-menopausal women.

- **Chemotherapy drugs:** Some chemo drugs can damage the ovaries of pre-menopausal women so they no longer make estrogen. For some women, ovarian function returns months or years later, but in others, the damage to the ovaries is permanent and leads to menopause. This side effect can sometimes be a helpful (if unintended) consequence of chemotherapy for breast cancer.

All of these methods can cause symptoms of menopause, including hot flashes, night sweats, vaginal dryness, and mood swings.

Less common types of hormone therapy

Some other types of hormone therapy were used more often in the past, but are rarely given now. These include:

- Megestrol acetate (Megace®), a progesterone-like drug
- Androgens (male hormones)
- High doses of estrogen

These might be an option if other forms of hormone therapy are no longer working, but they can often cause side effects.

Targeted therapy for breast cancer

As researchers have learned more about changes in cancer cells that cause them to grow out of control, they've developed new types of drugs that target some of these cell changes. These targeted drugs are designed to block the growth and spread of cancer cells. These drugs work differently from chemotherapy drugs, which attack all cells that are growing quickly (including cancer cells).

Targeted drugs sometimes work even when chemo drugs do not. Some targeted drugs can help other types of treatment work better. Targeted drugs also tend to have different (and often less severe) side effects than chemo.

Targeted therapy for HER2-positive breast cancer

For about 1 in 5 women with breast cancer, the cancer cells have too much of a growth-promoting protein known as HER2/neu (or just HER2) on their surface. These cancers, known as *HER2-positive breast cancers*, tend to grow and spread more aggressively. But a number of drugs have been developed that target this protein:

- **Trastuzumab (Herceptin):** This drug is a monoclonal antibody, which is a man-made version of a very specific immune system protein. It is often given along with chemo, but it might also be used by itself (especially if chemo alone has already been tried). Trastuzumab can be used to treat both early- and late-stage breast cancer. When started before or after surgery to treat early breast cancer, this drug is usually given for a total of a year. For advanced breast cancer, treatment is often given for as long as the drug is helpful. This drug is given into a vein (IV).
- **Pertuzumab (Perjeta):** This is also a monoclonal antibody. Pertuzumab can be given with trastuzumab and chemo, either before surgery to treat early-stage breast cancer, or to treat advanced breast cancer. This drug is given into a vein (IV).
- **Ado-trastuzumab emtansine (Kadcyla, also known as TDM-1):** This is a monoclonal antibody attached to a chemotherapy drug. It is used by itself to treat advanced breast cancer in women who have already been treated with trastuzumab and chemo. This drug is also given into a vein (IV).
- **Lapatinib (Tykerb):** This is a type of targeted drug known as a kinase inhibitor. It is taken daily as a pill. Lapatinib is used to treat advanced breast cancer, most often when trastuzumab is no longer working. It is typically used along with certain chemo or hormone therapy drugs.

Side effects of targeted therapy for HER2-positive breast cancer

The side effects of these drugs are often mild, but some serious side effects are possible. Discuss what you can expect with your doctor.

Some women develop **heart damage** during or after treatment with the antibody drugs (trastuzumab, pertuzumab, and ado-trastuzumab emtansine). This can lead to congestive heart failure (where the heart doesn't pump blood as well as it should). For most (but not all) women, this effect lasts a short time and gets better when the drug is stopped. The risk of heart problems is higher when these drugs are given with certain chemo drugs that also can cause heart damage, such as doxorubicin (Adriamycin) and epirubicin (Ellence). Because these drugs can cause heart damage, doctors often check your heart function (with an echocardiogram or a MUGA scan) before treatment, and check it again every few months while you are taking the drug. Major symptoms of congestive heart failure are **shortness of breath, leg swelling, and severe fatigue**. Let your doctor know if you develop any of these symptoms.

Lapatinib can cause **severe diarrhea**, so it's very important to let your health care team know about any changes in bowel habits as soon as they happen. This drug can also cause **hand-foot syndrome**, in which the hands and feet become sore and red, and may blister and peel.

If you are pregnant, you should not take these drugs. They can harm and even cause death to the fetus. If you could become pregnant, talk to your doctor about using effective birth control while taking these drugs.

Targeted therapy for hormone receptor-positive breast cancer

About 2 out of 3 breast cancers are hormone receptor-positive (ER-positive or PR-positive). For women with these cancers, treatment with hormone therapy is often helpful. Certain targeted therapy drugs can make hormone therapy even more effective, although these targeted drugs can also add to the side effects.

Palbociclib (Ibrance)

Palbociclib is approved for women who have gone through menopause and have advanced hormone receptor-positive, HER2-negative breast cancer. It is used along with a certain hormone therapy drugs called aromatase inhibitors, such as letrozole or fulvestrant.

Palbociclib blocks proteins in the cell called cyclin-dependent kinase (CDK) 4 and CDK6. Blocking these proteins in breast cancer cells that are hormone receptor-positive helps stop the cells from dividing to make new cells. This slows cancer growth.

Palbociclib is a pill that is taken once a day for 3 weeks at a time, with a week off before starting again.

Side effects of palbociclib tend to be mild and can include low red blood cell counts (**anemia**), fatigue, nausea, mouth sores, hair loss, and diarrhea. Severe low white blood cell counts can also occur, which can increase the risk of serious **infection**.

Everolimus (Afinitor)

Everolimus is approved for women who have gone through menopause and have advanced hormone receptor-positive, HER2-negative breast cancer. It is used along with the aromatase inhibitor exemestane (Aromasin) for women whose cancers have grown while they were being treated with either letrozole or anastrozole (or if the cancer started growing shortly after treatment with these drugs was stopped).

This targeted therapy drug blocks mTOR, a protein in cells that normally helps them grow and divide. Everolimus may also stop tumors from developing new blood vessels, which can help limit their growth. In treating breast cancer, this drug seems to help hormone therapy drugs work better.

Everolimus is a pill that is taken once a day.

Common side effects of everolimus include mouth sores, diarrhea, nausea, fatigue, feeling weak or tired, low blood counts, shortness of breath, and cough. Everolimus can also increase blood lipids (cholesterol and triglycerides) and blood sugars, so your doctor will check your blood work periodically while you are on this drug. It can also increase your risk of serious infections, so your doctor will watch you closely for infection while you are on treatment.

Everolimus is also being studied for use for earlier stage breast cancer, with other hormone therapy drugs, and in combination with other treatments.

More information about monoclonal antibodies can be found in *Cancer Immunotherapy*.

For more information about targeted therapy drugs, see *Targeted Therapy*.

Treatment of lobular carcinoma in situ

Lobular carcinoma in situ (LCIS) means abnormal cells are in the breast. LCIS is not cancer or pre-cancer, and it does not usually need to be treated. But having LCIS does raise a woman's risk for developing breast cancer. For that reason, if you have LCIS, you should have regular mammograms and doctor visits. Some women with LCIS take medicine to lower their risk of getting breast cancer.

Lobular carcinoma in situ (LCIS) is sometimes grouped with ductal carcinoma in situ (DCIS) as a type of non-invasive breast cancer, but it differs from DCIS in that it's not a pre-cancer. That is, it can't become an invasive cancer, even if it isn't treated.

Does LCIS need to be treated?

Since LCIS is not a true cancer or pre-cancer, often no treatment is recommended. Sometimes if a needle biopsy result shows LCIS, the doctor might recommend that it be removed completely (with an excisional biopsy or some other type of breast-conserving surgery) to help make sure that LCIS was the only thing there.

Having LCIS does increase your risk of developing invasive breast cancer later on, so close follow-up is very important. This usually includes a yearly mammogram and a breast exam. Close follow-up of both breasts is important because women with LCIS in one breast have the same increased risk of developing cancer in both breasts. There isn't enough evidence to recommend getting routine magnetic resonance imaging (MRI) in addition to mammograms for all women with LCIS, but it's reasonable for women with LCIS to talk with their doctors about their other risk factors and the benefits and limits of being screened yearly with MRI.

A certain kind of LCIS, called pleomorphic LCIS, may be more likely to turn into invasive cancer than most types of LCIS. Some doctors feel that this kind of LCIS needs to be removed completely with surgery.

Can you lower your risk of invasive breast cancer?

If you have LCIS, you may want to consider taking a hormone medicine such as tamoxifen or raloxifene (Evista) to help reduce your risk of breast cancer. (See *Medicines to Reduce Breast Cancer Risk*.) You might also want to consider taking part in a clinical trial for breast cancer prevention, or discussing other possible prevention strategies (such as getting to a healthy weight or starting an exercise program) with your doctor.

Because LCIS is linked to an increased risk of cancer in both breasts, some women with LCIS choose to have a bilateral simple mastectomy (removal of both breasts but not nearby lymph nodes) to lower this risk. This is more likely to be a reasonable option for women who also have other risk factors for breast cancer, such as a *BRCA* gene mutation or a strong family history. This may be followed by delayed breast reconstruction.

Treatment of ductal carcinoma in situ

Ductal carcinoma in situ (DCIS) means the cells that line the milk ducts of the breast have changed to look like cancer cells under a microscope, but they have not spread into surrounding breast tissue.

Ductal carcinoma in situ (DCIS) is considered non-invasive or pre-invasive breast cancer. DCIS can't spread outside the breast, but it still needs to be treated because it can sometimes go on to become invasive breast cancer. In most cases, a woman with DCIS can choose between breast-conserving surgery (BCS) and simple mastectomy. But in some cases a mastectomy might be a better option.

Breast-conserving surgery (BCS)

In breast-conserving surgery (BCS), the surgeon removes the tumor and a small amount of normal breast tissue around it. Lymph node removal is not always needed with BCS, but it may be done if the doctor thinks the area of DCIS might also contain invasive cancer. The risk of an area of DCIS containing invasive cancer goes up with tumor size and nuclear grade. If lymph nodes are removed, this is usually done as a sentinel lymph node biopsy (SLNB).

If BCS is done, it is usually followed by radiation therapy. This lowers the chance of the cancer coming back in the same breast (either as more DCIS or as an invasive cancer). BCS without radiation therapy is not a standard treatment, but it might be an option for certain women who had small areas of low-grade DCIS that were removed with large enough cancer-free surgical margins.

Mastectomy

Simple mastectomy (removal of the entire breast) may be needed if the area of DCIS is very large, if the breast has several areas of DCIS, or if BCS cannot remove the DCIS completely (that is, the BCS specimen and re-excision specimens have cancer cells in or near the surgical margins). Many doctors will do a SLNB along with the mastectomy. This is because if an area of invasive cancer is found in the tissue removed during a mastectomy, the doctor won't be able to go back and do the SLNB later, and so may have to do a full axillary lymph node dissection (ALND).

Women having a mastectomy for DCIS may choose to have breast reconstruction immediately or later.

Hormone therapy after surgery

If the DCIS is hormone receptor-positive (ER-positive or PR-positive), adjuvant treatment with tamoxifen (for any woman) or an aromatase inhibitor (for women past menopause) for 5 years after surgery can lower the risk of another DCIS or invasive cancer developing in either breast. If you have hormone receptor-positive DCIS, discuss the pros and cons of hormone therapy with your doctors.

Treatment of invasive breast cancer, by stage

The stage (extent) of your breast cancer is an important factor in making decisions about your treatment. In general, the more the breast cancer has spread, the more treatment you will likely need. But your treatment options are affected by your personal preferences and other information about your breast cancer, such as:

- If the cancer cells contain hormone receptors (that is, if the cancer is ER-positive or PR-positive)
- If the cancer cells have large amounts of the HER2 protein (that is, if the cancer is HER2-positive)
- Your overall health

Talk with your doctor about how these factors can affect your treatment options.

Stage I

These breast cancers are still relatively small and either have not spread to the lymph nodes or have a tiny area of cancer spread in the sentinel lymph node (the first lymph node to which cancer is likely to spread).

Surgery

Surgery is the main treatment for stage I breast cancer. These cancers can be treated with either breast-conserving surgery (BCS; sometimes called lumpectomy or partial mastectomy) or mastectomy. The nearby lymph nodes will also need to be checked, either with a sentinel lymph node biopsy (SLNB) or an axillary lymph node dissection (ALND).

In some cases, breast reconstruction can be done during the surgery to remove the cancer. But if you will need radiation therapy after surgery, it is often better to wait to get reconstruction until after the radiation is complete.

Radiation therapy

If mastectomy is done, radiation therapy is not usually needed. If BCS is done, radiation therapy is usually given after surgery to lower the chance of the cancer coming back in the breast. Women who are at least 70 years old may consider BCS without radiation therapy if ALL of the following are true:

- The tumor was 2 cm (a little less than 1 inch) or less across and it has been removed completely.
- The tumor contains hormone receptors and hormone therapy is given.
- None of the lymph nodes removed contained cancer.

Radiation after BCS still lowers the chance of the cancer coming back in women who meet these criteria, but it has not been shown to help them live longer.

Some women who do not meet these criteria may be tempted to avoid radiation, but studies have shown that not getting radiation increases the chances of the cancer coming back and can shorten their lives.

Adjuvant systemic therapy (chemo and other drugs)

For women who have a hormone receptor-positive (ER-positive or PR-positive) breast cancer, most doctors will recommend hormone therapy (tamoxifen or an aromatase inhibitor, or one followed by the other) as an adjuvant (additional) treatment, no matter how small the tumor is. Women with tumors larger than 0.5 cm (about ¼ inch) across may be more likely to benefit from it. Hormone therapy is typically given for at least 5 years.

If the tumor is smaller than 1 cm (about ½ inch) across, adjuvant chemotherapy (chemo) is not usually needed. Some doctors may suggest chemo if a cancer smaller than 1 cm has any unfavorable features (such as being high-grade, hormone receptor-negative, HER2-

positive, or having a high score on a gene panel such as Oncotype Dx). Adjuvant chemo is usually recommended for larger tumors.

For HER2-positive cancers, a year of adjuvant trastuzumab (Herceptin) is usually recommended as well.

For more information on adjuvant therapy, see “Drug treatment for stages I to III breast cancer.”

Stage II

These breast cancers are larger than stage I cancers and/or have spread to a few nearby lymph nodes.

Local therapy (surgery and radiation therapy)

Stage II cancers are treated with either breast-conserving surgery (BCS; sometimes called lumpectomy or partial mastectomy) or mastectomy. The nearby lymph nodes will also need to be checked, either with a sentinel lymph node biopsy (SLNB) or an axillary lymph node dissection (ALND). Women who have BCS, or who have a mastectomy but have a large tumor (more than 5 cm or about 2 inches across) or cancer cells in the lymph nodes, are treated with radiation therapy after surgery. If chemotherapy is also needed after surgery, the radiation is delayed until the chemo is done.

In some cases, breast reconstruction can be done during the surgery to remove the cancer. But if you will need radiation after surgery, it is often better to wait to get reconstruction until after the radiation is complete.

Neoadjuvant and adjuvant systemic therapy (chemo and other drugs)

Systemic therapy is recommended for women with stage II breast cancer. Some systemic therapies are given before surgery (neoadjuvant therapy), and others are given after surgery (adjuvant therapy). Neoadjuvant treatments are often a good option for women with large tumors, because they can shrink the tumor before surgery, possibly enough to make BCS an option. But this doesn't improve survival more than getting the drugs after surgery. In some cases, systemic therapy will be started before surgery and then continued after surgery.

The drugs used will depend on the woman's age and the tumor's hormone-receptor status and HER2 status. They may include:

- **Chemotherapy:** Chemo can be given before or after surgery.
- **HER2 targeted drugs:** If the cancer is HER2-positive, HER2 targeted drugs are started along with chemo. Both trastuzumab (Herceptin) and pertuzumab (Perjeta)

may be used as a part of neoadjuvant treatment. Then trastuzumab is continued after surgery for a total of one year of treatment.

- **Hormone therapy:** If the cancer is hormone receptor-positive, hormone therapy (tamoxifen, an aromatase inhibitor, or one followed by the other) is typically used. It can be started before surgery, but because it continues for at least 5 years, it needs to be given after surgery as well.

For more information on adjuvant and neoadjuvant therapy, see “Drug treatment for stages I to III breast cancer.”

Stage III

In stage III breast cancer, the tumor is large (more than 5 cm or about 2 inches across) or growing into nearby tissues (the skin over the breast or the muscle underneath), or the cancer has spread to many nearby lymph nodes.

If you have inflammatory breast cancer: Stage III cancers also include some inflammatory breast cancers that have not spread beyond nearby lymph nodes. Treatment of these cancers can be slightly different from the treatment of other stage III breast cancers. See *Inflammatory Breast Cancer* for details.

There are two main approaches to treating stage III breast cancer:

Starting with neoadjuvant therapy

Most often, these cancers are treated with neoadjuvant chemotherapy (before surgery). For HER2-positive tumors, the targeted drug trastuzumab (Herceptin) is given as well, sometimes along with pertuzumab (Perjeta). This may shrink the tumor enough to allow a woman to have breast-conserving surgery (BCS). If the tumor doesn't shrink enough, a mastectomy is done. Nearby lymph nodes will also need to be checked. A sentinel lymph node biopsy (SLNB) is often not an option for stage III cancers, so an axillary lymph node dissection (ALND) is usually done.

Often, radiation therapy is needed after surgery. If breast reconstruction is done, it is usually delayed until after radiation is complete. In some cases, additional (adjuvant) chemo is given after surgery as well. Women with HER2-positive cancers receive trastuzumab after surgery to complete a year of treatment. Women with hormone receptor-positive (ER-positive or PR-positive) breast cancers will get adjuvant hormone therapy.

Starting with surgery

Another option for stage III cancers is to treat with surgery first. Because these tumors are fairly large and/or have grown into nearby tissues, this usually means getting a

mastectomy. For women with fairly large breasts, BCS may be an option if the cancer hasn't grown into nearby tissues. SLNB may be an option for some patients, but most will need an ALND. Surgery is usually followed by adjuvant systemic chemotherapy, and/or hormone therapy, and/or trastuzumab. Radiation is recommended after surgery.

For more information on adjuvant and neoadjuvant therapy, see “Drug treatment for stages I to III breast cancer.”

Drug treatment for stages I to III breast cancer

Most women with breast cancer in stages I to III will get some kind of drug therapy as part of their treatment. This may include:

- Chemotherapy
- Hormone therapy (tamoxifen, an aromatase inhibitor, or one followed by the other)
- HER2 targeted drugs, such as trastuzumab (Herceptin) and pertuzumab (Perjeta)
- Some combination of these

The types of drugs that might work best depend on the tumor's hormone receptor status, HER2 status, and other factors.

When is chemotherapy (chemo) used?

Chemo is usually recommended for all women with an invasive breast cancer whose tumor is hormone receptor-negative (ER-negative and PR-negative). It's also typically recommended for women with hormone receptor-positive tumors who might benefit from getting chemo along with their hormone therapy, based on the stage and characteristics of their tumor.

Chemo, given either before surgery (neoadjuvant chemo) or after surgery (adjuvant chemo), can lower the risk of the cancer coming back, but it doesn't remove the risk entirely. Before deciding if it's right for you, talk to your doctor to make sure you understand the chance of your cancer returning both with or without getting chemo.

If you will be getting chemo, your doctor should discuss what specific drug regimens are best for you based on your cancer, its stage, your other health issues, and your preferences. The length of treatment usually ranges from 3 to 6 months.

When is hormone therapy used?

Hormone therapy is recommended for all women with hormone receptor-positive (ER-positive or PR-positive) invasive breast cancer, regardless of the size of the tumor or the

number of lymph nodes with cancer cells. Hormone therapy is not likely to be effective for women with hormone receptor-negative tumors.

For post-menopausal women: Women who have gone through menopause and who have hormone receptor-positive tumors will generally get adjuvant hormone therapy. This might consist of:

- An aromatase inhibitor, such as anastrozole (Arimidex), letrozole (Femara), or exemestane (Aromasin) for 5 years
- Tamoxifen for 2 to 5 years followed by an aromatase inhibitor for 3 to 5 more years
- Tamoxifen for 5 to 10 years (for women who can't take aromatase inhibitors)

Chemotherapy can sometimes slow or stop ovarian function for a time. Women who stopped having periods during or after chemo may need their hormone levels tested to check to see if they are truly in menopause. Many women whose periods stopped from chemo have not truly gone through menopause, and their periods will return.

For pre-menopausal women: For women who haven't gone through menopause, the most common treatment is tamoxifen, which is taken for 5 to 10 years. Aromatase inhibitors don't help if the ovaries are still making estrogen, so they are not usually given to pre-menopausal women.

Some doctors also give a drug called a luteinizing hormone-releasing hormone (LHRH) analog, which temporarily stops the ovaries from functioning. Another (permanent) option is surgical removal of the ovaries (oophorectomy). Still, it's not clear that removing the ovaries or stopping them from working helps tamoxifen work better for cancers that have been removed completely, so these treatments are not standard.

If you go through menopause during tamoxifen treatment (either naturally or because your ovaries are removed), you may be switched from tamoxifen to an aromatase inhibitor. Still, women may stop having periods on tamoxifen without truly going through menopause, so blood tests of hormone levels are often needed to see if you are in menopause and can benefit from aromatase inhibitors. Women who had their uterus removed (a hysterectomy) but still have their ovaries may need to have blood tests to check hormone levels to see if they have gone through menopause before taking an aromatase inhibitor.

Another option for pre-menopausal women (instead of tamoxifen), is taking an LHRH analog to turn off the ovaries along with an aromatase inhibitor.

Hormone therapy and chemotherapy: Hormone therapy might be started right away if you are not getting chemo. But getting hormone therapy and chemo together can make the chemo less effective, so hormone therapy is usually not started until after chemo is completed.

When are HER2 targeted drugs used?

Women who have HER2-positive cancers are usually given trastuzumab (Herceptin) along with chemo as part of their treatment. If the treatment is given before surgery (called neoadjuvant therapy), pertuzumab (Perjeta) may be given as well. After chemo is finished, the trastuzumab is continued to complete a year of treatment.

Because these drugs can lead to heart problems, heart function is watched closely during treatment with tests such as echocardiograms or MUGA scans.

Online tools to help make decisions

To help decide if adjuvant therapy is right for you, you might want to visit the Mayo Clinic website at www.mayoclinic.com and type "adjuvant therapy for breast cancer" into the search box. You will find a page that will help you to understand the possible benefits and limits of adjuvant therapy.

Other online guides, such as www.adjuvantonline.com, are designed to be used by health care professionals. This website has information about your risk of the cancer returning within the next 10 years and what benefits you might expect from hormone therapy and/or chemotherapy. You may want to ask your doctor if he or she uses this site.

Stage IV

Stage IV cancers have spread beyond the breast and nearby lymph nodes to other parts of the body. When breast cancer spreads, it most commonly goes to the bones, liver, and lungs. As the cancer progresses, it may also spread to the brain or other organs.

For women with stage IV breast cancer, systemic (drug) therapies are the main treatments. These may include:

- Hormone therapy
- Chemotherapy (chemo)
- Targeted drugs, such as trastuzumab (Herceptin) and pertuzumab (Perjeta)
- Some combination of these

Less often, surgery and/or radiation therapy may be useful in certain situations (see below).

Treatment can often shrink tumors (or slow their growth), improve symptoms, and help women live longer. But in general, these cancers are very hard to cure.

Systemic (drug) treatments for stage IV breast cancer

The types of drugs used for stage IV breast cancer depend on the hormone receptor status and the HER2 status of the cancer:

- **Hormone receptor-positive cancers:** Women with hormone receptor-positive (ER-positive or PR-positive) cancers are often treated first with hormone therapy (tamoxifen or an aromatase inhibitor). Women who are post-menopausal are often treated first with an aromatase inhibitor. This may be combined with a targeted drug such as palbociclib (Ibrance) or everolimus (Afinitor). Women who haven't yet gone through menopause are often treated first with tamoxifen. But because hormone therapy can take months to work, chemo is often the first treatment for patients with serious problems from their cancer spread, such as problems breathing.
- **Hormone receptor-negative cancers:** Chemo is the main treatment for women with hormone receptor-negative (ER-negative and PR-negative) cancers, because hormone therapy isn't helpful for these cancers.
- **HER2-positive cancers:** Trastuzumab (Herceptin) may help women with HER2-positive cancers live longer if it's given along with chemo. Pertuzumab (Perjeta), another targeted drug, might be added as well. Another option is the targeted drug ado-trastuzumab emtansine (Kadcyla), which is given alone.
- Treatment often continues until the cancer starts growing again or until side effects become unacceptable. If this happens, other drugs might be tried.

Local or regional treatments for stage IV breast cancer

Although systemic drugs are the main treatment for stage IV breast cancer, local and regional treatments such as surgery, radiation therapy, or regional chemotherapy are sometimes used as well. These can help treat breast cancer in a specific part of the body, but they are very unlikely to get rid of all of the cancer. These treatments are more likely to be used to help prevent or treat symptoms or complications from the cancer.

Radiation therapy and/or surgery may also be used in certain situations, such as:

- When the breast tumor is causing an open wound in the breast (or chest)
- To treat a small number of metastases in a certain area, such as the brain
- To help prevent bone fractures
- When an area of cancer spread is pressing on the spinal cord
- To treat a blood vessel blockage in the liver
- To provide relief of pain or other symptoms

In some cases, regional chemo (where drugs are delivered directly into a certain area, such as into the fluid around the brain or into the liver) may be useful as well.

If your doctor recommends such local or regional treatments, it is important that you understand their goal—whether it is to try to cure the cancer or to prevent or treat symptoms.

Relieving symptoms of advanced breast cancer

Treatment to relieve symptoms (palliative treatment) depends on where the cancer has spread. For example, pain from bone metastases may be treated with radiation therapy and/or drugs called bisphosphonates such as pamidronate (Aredia) or zoledronic acid (Zometa). Most doctors recommend bisphosphonates or the drug denosumab (Xgeva), along with calcium and vitamin D, for all patients whose breast cancer has spread to their bones. For more information about treatment of bone metastases, see *Bone Metastasis*.

Advanced cancer that progresses during treatment

Treatment for advanced breast cancer can often shrink the cancer or slow its growth (often for many years), but after a time, it tends to stop working. Further treatment options at this point depend on several factors, including previous treatments, where the cancer is located, and a woman's age, general health, and desire to continue getting treatment.

Progression while on hormone therapy

For hormone receptor-positive (ER-positive or PR-positive) cancers that were being treated with hormone therapy, switching to another type of hormone therapy sometimes helps. For example, if either letrozole (Femara) or anastrozole (Arimidex) were given, using everolimus (Afinitor) with exemestane may be an option. If the cancer is no longer responding to any hormone drugs, chemotherapy is usually the next step.

Progression while on chemotherapy

If the cancer is no longer responding to one chemo regimen, trying another may be helpful. Many different drugs and combinations can be used to treat breast cancer. However, each time a cancer progresses during treatment, it becomes less likely that further treatment will have an effect.

Progression while getting HER2 drugs

HER2-positive cancers that no longer respond to trastuzumab (Herceptin) might respond to lapatinib (Tykerb), another drug that attacks the HER2 protein. This drug is often

given along with the chemo drug capecitabine (Xeloda), but it can be used with other chemo drugs, with trastuzumab, or even alone (without chemo). Other options for women with HER2-positive cancers include pertuzumab (Perjeta) with chemo and trastuzumab, or ado-trastuzumab emtansine (Kadcyla).

Because current treatments are very unlikely to cure advanced breast cancer, if you are in otherwise good health, you may want to think about taking part in a clinical trial testing a newer promising treatment.

Recurrent breast cancer

For some women, breast cancer may come back after treatment – sometimes years later. This is called a *recurrence*. Recurrence can be local (in the same breast or in the mastectomy scar), regional (in nearby lymph nodes), or in a distant area. Cancer that is found in the opposite breast is not a recurrence—it is a new cancer that requires its own treatment.

Treating local recurrence

For women whose breast cancer has recurred locally, treatment depends on their initial treatment. If you had breast-conserving surgery, a local recurrence in the breast is usually treated with mastectomy. If the initial treatment was mastectomy, recurrence near the mastectomy site is treated by removing the tumor whenever possible. This is followed by radiation therapy, but only if none had been given after the original surgery. (Radiation usually can't be given to the same area twice.) In either case, hormone therapy, targeted therapy (like trastuzumab), chemotherapy, or some combination of these may be used after surgery and/or radiation therapy.

Treating regional recurrence

When breast cancer comes back in nearby lymph nodes (such as those under the arm or around the collar bone), it is treated by removing those lymph nodes. This may be followed by radiation aimed at the area. Systemic treatment (such as chemo, targeted therapy, or hormone therapy) may be considered after the local treatment as well.

Treating distant recurrence

In general, women whose breast cancer comes back in other organs, such as the bones, lungs, or brain, are treated the same way as those found to have stage IV breast cancer in these organs when they were first diagnosed (see treatment for stage IV). The only difference is that treatment may be affected by previous treatments a woman has had.

Recurrent breast cancer can sometimes be hard to treat. If you are in otherwise good health, you may want to think about taking part in a clinical trial testing a newer promising treatment.

See the Understanding Recurrence section for more information.

Treatment of breast cancer during pregnancy

Breast cancer is diagnosed in about 1 pregnant woman out of 3,000. In general, treatment recommendations depend upon how long the woman has been pregnant.

Radiation therapy during pregnancy is known to increase the risk of birth defects, so it is not recommended for pregnant women with breast cancer. Since breast-conserving surgery (BCS) needs to be followed with radiation, BCS is only an option if radiation can be delayed until after the baby is delivered. But breast biopsy procedures and even mastectomy and lymph node removal can be done safely in pregnancy.

For a long time it was assumed that chemotherapy (chemo) was dangerous to the fetus. But several studies have found that using certain chemo drugs during the second and third trimesters (the fourth to ninth months) does not increase the risk of birth defects. Because of concern about the potential damage to the fetus, the safety of chemo during the first trimester (the first 3 months) of pregnancy has not been studied.

Both hormone therapy and targeted therapy can affect the fetus and should not be started until after the baby is born.

Many chemo and hormone therapy drugs can enter breast milk and could be passed on to the baby, so breastfeeding is not usually recommended during chemo, hormone, or targeted therapy.

If you'd like more information on a drug used in your treatment, call us with the names of the medicines you're taking.

For more information, see *Pregnancy and Breast Cancer*.

What should you ask your cancer care team about breast cancer?

The doctors, nurses, and other members of your cancer care team are the best source of information about your cancer. They will explain your diagnosis, treatment options, and progress. But not all women want the same amount of information or have the same questions. You can take an active role in your care by learning about your cancer and its treatment and by asking questions.

Here are some questions that you can use to help you better understand your cancer and your treatment options. Don't be afraid to take notes and tell the doctors or nurses when you don't understand what they're saying. You might want to bring another person with you when you see your doctors, and/or ask if it's OK to record your conversation to help you remember what was said.

Not all of these questions will apply to you, but they should help get you started.

When you're told you have breast cancer

- Exactly what type of breast cancer do I have?
- How big is the cancer? Where exactly is it?
- Has the cancer spread to my lymph nodes or other organs?
- What's the stage of the cancer? What does that mean?
- Will I need any other tests before we can decide on treatment?
- Do I need to see any other doctors or health professionals?
- What is the hormone receptor status of my cancer? What does this mean?
- What is the HER2 status of my cancer? What does this mean?
- How do these factors affect my treatment options and long-term outlook (prognosis)?
- What are my chances of survival, based on my cancer as you see it?
- Should I think about genetic testing? What would the pros and cons of testing be?
- How do I get a copy of my pathology report?
- If I'm concerned about the costs and insurance coverage for my diagnosis and treatment, who can help me?

When deciding on a treatment plan

- How much experience do you have treating this type of cancer?
- Should I get a second opinion? How do I do that?
- What are my treatment choices?
- What treatment do you recommend and why?
- Should I think about taking part in a clinical trial?

- What would the goal of the treatment be?
- How soon do I need to start treatment?
- How long will treatment last? What will it be like? Where will it be done?
- Will any of the treatment be done by other doctors?
- What should I do to get ready for treatment?
- What risks and side effects should I expect?
- What can I do to reduce the side effects of the treatment?
- Should I change what I eat or make other lifestyle changes?
- How will treatment affect my daily activities?
- Will I be able to work during treatment?
- Will I lose my hair? If so, what can I do about it?
- Will I go through menopause as a result of the treatment? Will I be able to have children after treatment? Would I be able to breastfeed?
- What are the chances the cancer will come back after this treatment?
- What would we do if the treatment doesn't work or if the cancer comes back?

If you need surgery

- Is breast-conserving surgery (lumpectomy) an option for me? Why or why not?
- What are the pros and cons of breast-conserving surgery versus mastectomy?
- How many surgeries like mine have you done?
- Will you have to take out lymph nodes? If so, would you advise a sentinel lymph node biopsy? Why or why not?
- What side effects might lymph node removal cause?
- Will I need blood transfusions?
- How long will I be in the hospital?
- Will I have stitches or staples at the surgery site? Will there be a drain (tube) coming out of the site?

- How do I care for the surgery site? Will I need someone to help me?
- What will my breasts look and feel like after my treatment? Will I have normal feeling in them?
- What will the scar look like?
- Is breast reconstruction surgery an option if I want it? What would it involve in my case?
- Can I have reconstruction at the same time as the surgery to remove the cancer? What are the pros and cons of having it done right away or waiting until later?
- What types of reconstruction might be options for me?
- Should I speak with a plastic surgeon about reconstruction options?
- Will I need a breast form (prosthesis), and if so, where can I get one?
- Do I need to stop taking any medications or supplements before surgery?
- When will I need to return for a follow-up visit?
- When should I call your office if I'm having side effects?

During treatment

Once treatment begins, you'll need to know what to expect and what to look for. Not all of these questions may apply to you, but asking the ones that do may be helpful.

- How will we know if the treatment is working?
- Is there anything I can do to help manage side effects?
- What symptoms or side effects should I tell you about right away?
- How can I reach you on nights, holidays, or weekends?
- Do I need to change what I eat during treatment?
- Are there any limits on what I can do?
- What kind of exercise should I do, and how often?
- Can you suggest a mental health professional I can see if I start to feel overwhelmed, depressed, or distressed?
- Will I need special tests, such as imaging scans or blood tests? How often?

After treatment

- Do I need a special diet after treatment?
- Are there any limits on what I can do?
- Am I at risk for lymphedema?
- What can I do to reduce my risk for lymphedema?
- What should I do if I notice swelling?
- What other symptoms should I watch for?
- What kind of exercise should I do now?
- What type of follow-up will I need after treatment?
- How often will I need to have follow-up exams and imaging tests?
- Will I need any blood tests?
- How will we know if the cancer has come back? What should I watch for?
- What would my options be if the cancer comes back?

Other questions

Be sure to write down any other questions you think of. For instance, you might want specific information about recovery times so that you can plan your work schedule. Or you may want to ask about nearby or online support groups where you can talk with other women going through similar situations.

Living as a breast cancer survivor

For many women with breast cancer, treatment may remove or destroy the cancer. The end of treatment can be both stressful and exciting. You'll be relieved to finish treatment, yet it's hard not to worry about cancer coming back. This is very common among people who have had cancer.

For other women, breast cancer may never go away completely. Some women may get regular treatments with chemotherapy, radiation therapy, or other treatments to try to help keep the cancer in check. Learning to live with cancer that does not go away can be difficult and very stressful. Living with cancer is different from living after cancer.

Life after breast cancer means returning to some familiar things and also making some new choices.

Follow-up care after breast cancer treatment

Even after you have completed breast cancer treatment, your doctors will want to watch you closely. It's very important to go to all of your follow-up appointments. During these visits, your doctors will ask if you are having any problems and may do exams and lab tests or imaging tests to look for signs of cancer or treatment side effects.

Almost any cancer treatment can have side effects. Some might only last for a few days or weeks, but others might last a long time. Some side effects might not even show up until years after you have finished treatment. Visits with your doctor are a good time for you to ask questions and talk about any changes or problems you notice or concerns you have.

Typical follow-up schedules after breast cancer

- **Doctor visits:** At first, your follow-up doctor visits will probably be scheduled for every few months. The longer you have been free of cancer, the less often the appointments are needed. After 5 years, they are typically done about once a year.
- **Mammograms:** If you had breast-conserving surgery, you will get a mammogram about 6 months after surgery and radiation are completed, and then at least every year after that. If you had a mastectomy you will still need to have yearly mammograms on the remaining breast.
- **Pelvic exams:** If you are taking either of the hormone drugs tamoxifen or toremifene, you should have pelvic exams every year because these drugs can increase your risk of uterine cancer. This risk is highest in women who have gone through menopause. Be sure to tell your doctor right away about any unusual vaginal bleeding, such as vaginal bleeding or spotting after menopause, bleeding or spotting between periods, or a change in your periods. Although this is usually caused by something that isn't cancer, it can also be the first sign of uterine cancer.
- **Bone density tests:** If you are taking an aromatase inhibitor (anastrozole, letrozole, or exemestane) for early-stage breast cancer, your doctor will want to monitor your bone health and may consider testing your bone density.
- **Other tests:** Other tests such as blood tests and imaging tests (like bone scans and chest x-rays) are not a standard part of follow-up because they haven't been shown to help a woman treated for breast cancer live longer. But they might be done if you have symptoms or physical exam findings that suggest that the cancer might have come back (recurrence). These and other tests may also be done as part of evaluating new treatments by clinical trials.

If symptoms, exams, or tests suggest a possible recurrence of your cancer, imaging tests such as an x-ray, CT scan, PET scan, MRI scan, bone scan, and/or a biopsy may be done. Your doctor may also look for circulating tumor cells in the blood or measure levels of

blood tumor markers such as CA-15-3, CA 27-29, or CEA. The blood levels of tumor markers go up in some women if their cancer has spread to bones or other organs such as the liver. They are not elevated in all women with recurrence, so they aren't always helpful. If they are elevated, your doctor might use them to monitor the results of therapy.

Keeping health insurance and copies of your medical records

Even after treatment, it's very important to keep health insurance. Tests and doctor visits cost a lot, and even though no one wants to think of their cancer coming back, this could happen.

At some point after your cancer treatment, you might find yourself seeing a new doctor who doesn't know about your medical history. It's important to keep copies of your medical records to give your new doctor the details of your diagnosis and treatment. Learn more in *Keeping Copies of Important Medical Records*.

Managing long-term side effects

Most side effects go away after treatment ends, but some may continue and need special care to manage. Some of the side effects more likely to occur after breast cancer treatment include:

- Lymphedema
- Post-mastectomy pain syndrome
- Chemo brain

If the cancer comes back (recurs)

If cancer does recur, your treatment options will depend on the location of the cancer and what treatments you've had before. Options might include surgery, radiation therapy, hormone therapy, chemotherapy, targeted therapy, or some combination of these. For more information on how recurrent cancer is treated, see "Treatment of breast cancer, by stage." For more general information on dealing with a recurrence, see the Understanding Recurrence section of our website.

Emotional aspects of breast cancer

Some amount of depression, anxiety, and fear is normal when breast cancer is a part of your life. Some people are affected more than others. But everyone can benefit from help

and support from other people, whether friends and family, religious groups, support groups, professional counselors, or others.

You'll probably be concerned that the cancer might come back, and you might find yourself thinking about death and dying. Maybe you're more aware of the effects the cancer has had on your family, friends, and career. You may take a new look at your relationships with those around you. Unexpected issues might also cause concern. For instance, you might be stressed by financial concerns resulting from your treatment. You might also see your health care team less often after treatment and have more time on your hands. Any of these things might make you anxious.

Special issues women with breast cancer face

Many women with breast cancer face additional stressful issues. For example, you might have changes in your appearance as a result of breast cancer surgery. You may also have concerns about sexuality after breast cancer. For more on these topics, see "Body image and sexuality after breast cancer."

For younger breast cancer survivors, changes in appearance and sexuality might be even more stressful. Some women might still be thinking about having a family, and might worry about how the cancer and its treatment might affect this. Others might have already started families and might worry about how this could affect them. For some women, chemotherapy may cause early menopause, which can be very distressing on its own.

Regardless of the changes you may experience, it's important to know that there is advice and support out there to help you cope.

Finding help and support

Almost everyone who is going through or has been through cancer can benefit from some type of support. You need people you can turn to for strength and comfort. Support can come in many forms: family, friends, cancer support groups, religious or spiritual groups, online support communities, or one-on-one counselors. What's best for you depends on your situation and personality. Some people feel safe in peer-support groups or education groups. Others would rather talk in an informal setting, such as church. Others may feel more at ease talking one-on-one with a trusted friend or counselor. Whatever your source of strength or comfort, make sure you have a place to go with your concerns.

There are many support groups available, such as the American Cancer Society Reach To Recovery program. This program matches you up with a local volunteer who has had breast cancer. As someone who's been through the experience, your Reach To Recovery volunteer can answer many of your questions.

The cancer journey can feel very lonely. You shouldn't feel the need to try to deal with everything on your own, and your friends and family may feel shut out if you don't include them. Let them in, and let in anyone else who you feel may help.

If you aren't sure who can help, call your American Cancer Society at 1-800-227-2345 and we can put you in touch with a group or resource that may work for you.

Body image and sexuality after breast cancer

Feeling good about your body during and after breast cancer treatment

Along with the emotional stress that cancer and its treatment can cause, many women with breast cancer also find themselves coping with changes in their appearance as a result of their treatment.

Some changes may be short term, such as hair loss. But even short-term changes can have a profound effect on how a woman feels about herself. A number of options are available to help you cope with hair loss, including wigs, hats, scarves, and other accessories. Alternatively, some women choose to use their baldness as a way to identify themselves as breast cancer survivors.

Other changes are more permanent, like the loss of part or all of a breast (or breasts) after surgery. Some women choose to have reconstructive surgery to rebuild the breast mound. If you decide not to have breast reconstruction, you can decide whether to wear a breast form or prosthesis or not.

Sexuality after breast cancer

You may have concerns about sexuality after breast cancer. Physical changes, especially after breast surgery, can make some women less comfortable with their bodies. There may be a loss of sensation in the affected breast. Other treatments for breast cancer, such as chemotherapy, can change your hormone levels and may affect your sexual interest and/or response.

Relationship issues are also important. Your partner may worry about how to express love physically and emotionally after treatment, especially after surgery. But breast cancer can be a growth experience for couples – especially when partners take part in decision-making and go along to treatments.

To learn more, see *Sexuality for the Woman with Cancer*.

Finding help and support

Regardless of the changes you may experience, it's important to know that there is advice and support out there to help you cope with them. Speaking with your doctor or other members of your health care team is often a good starting point. There are also many support groups available, such as the American Cancer Society Reach To Recovery program. This program matches you up with a local volunteer who has had breast cancer. Your Reach To Recovery volunteer can answer many of your questions. She can give you suggestions, additional reading material, and advice. Remember that she's been there and will probably understand.

Some studies suggest that younger women, who represent about 1 out of 4 breast cancer survivors, tend to have more problems adjusting to the stresses of breast cancer and its treatment. It can feel socially isolating. Younger women may also be more affected by issues of sexuality or fertility. If you are having trouble adjusting after a breast cancer diagnosis, look for a counselor or a support group directed at younger breast cancer survivors.

Pregnancy after breast cancer

Many women are able to become pregnant after treatment for breast cancer. However, some treatments make it harder to get pregnant. If you think you may want to have children one day, or just want to keep your options open, the best time to talk to your doctor about fertility is before you begin breast cancer treatment.

Breast cancer is most common in older women. But if you are a younger woman who has had breast cancer, you might have questions about how breast cancer could affect your ability to have children and whether there are any extra risks.

Does breast cancer or its treatment affect my ability to have a baby?

Some treatments for breast cancer may affect a woman's fertility (ability to have a baby). For example, chemotherapy for breast cancer might damage the ovaries, which can sometimes cause immediate or delayed infertility. Still, many women are able to become pregnant after treatment. The best time to talk with your doctor about fertility is **before** starting breast cancer treatment. For more about how cancer treatment can affect fertility, see *Fertility and Women With Cancer*.

Could pregnancy make it more likely my breast cancer will come back?

Many breast cancers are sensitive to estrogen, so there has been concern that for women who have had breast cancer, the high hormone levels that result from a pregnancy might increase the chance of the cancer coming back. Studies have shown, though, that pregnancy does not increase the risk of the cancer coming back after successful treatment.

There's also no proof that breastfeeding after breast cancer treatment increases the risk of recurrence. In fact, some research suggests having a history of breastfeeding might actually lower the risk of the cancer coming back.

How long after breast cancer treatment should I wait before becoming pregnant?

If you want to have children, many doctors advise breast cancer survivors to wait at least 2 years after all treatment has finished before trying to get pregnant. The best length of time to wait is not clear, but 2 years is thought to be enough time to find any early return of the cancer, which could affect your decision to become pregnant. Keep in mind that this advice is not based on data from any clinical trials. And some breast cancers can come back after the 2-year mark, so every case is different. Your decision should be based on many things, including your age, desire for more pregnancies, type of breast cancer, and the risk of the cancer coming back early.

If I get pregnant, would my history of breast cancer put my baby at risk?

There is no proof that a woman's past breast cancer has any direct effect on her baby. Researchers have found no increased rate of birth defects or other long-term health concerns in children born to women who have had breast cancer.

Could breast cancer treatment affect my unborn baby?

If you are still getting any type of treatment for breast cancer, including chemotherapy, hormone therapy, or targeted therapy, talk to your doctor before trying to become pregnant. These drugs could affect a growing fetus, so it is safer to wait to get pregnant until all treatment is complete. It's also important to remember that stopping treatment early can increase the risk of the cancer growing or coming back. See *Breast Cancer During Pregnancy* for more information.

Can I breastfeed after breast cancer treatment?

If you have had breast surgery and/or radiation, you may have problems breastfeeding from the affected breast. Studies have shown reduced milk production in that breast as well as structural changes that can make it difficult and painful for the baby to latch onto the breast. Still, many women are able to breastfeed.

If you are still taking any medicines to treat your breast cancer (such as tamoxifen), it's very important to talk with your doctor before trying to breastfeed. Some drugs can enter the breast milk and might affect the baby.

Talk to your doctor

If you have or have had breast cancer and are thinking about having children, talk with your doctor about how treatment could affect your chances for pregnancy. This discussion should also cover the risk of the cancer coming back. In many cases, counseling can help you sort through the choices that come with surviving breast cancer and planning a pregnancy.

Menopausal hormone therapy after breast cancer

Taking hormone therapy to help with menopause symptoms may not be safe for women who have had breast cancer. This is a problem for many women who get symptoms such as hot flashes from their cancer treatment, or just because they are getting older. If you are bothered by menopause symptoms, talk to your doctor about other ways to get help.

Some pre-menopausal women have menopause symptoms as a result of chemotherapy or ovarian ablation. Some hormone therapy drugs used to treat breast cancer (such as tamoxifen and aromatase inhibitors) can also cause menopause symptoms.

Women who are past menopause might also get symptoms if they had to stop taking post-menopausal hormone therapy (PHT), also called hormone replacement therapy (HRT).

Can I take menopausal hormone therapy after breast cancer?

When women reach menopause, some choose to take PHT, which is made up of female hormones (estrogen, sometimes along with progesterone) to help reduce menopause symptoms. But doctors have been concerned about women who have had breast cancer using PHT, because of the known link between estrogen levels and breast cancer growth.

In the past, doctors often offered PHT after breast cancer treatment to women suffering from severe symptoms because early studies had shown no harm. But a well-designed clinical trial (the HABITS study) found that breast cancer survivors taking PHT were much more likely to develop a new or recurrent breast cancer than women who were not taking the drugs. Most doctors now feel that if a woman was previously treated for breast cancer, taking PHT would be unwise.

Relieving menopausal symptoms without hormone therapy

If you are having trouble with menopause symptoms, talk to your doctor about other ways besides PHT to help with specific symptoms.

Soy products: Some doctors have suggested that phytoestrogens (estrogen-like substances from certain plant sources, such as soy products) may be safer than the estrogens used in PHT. Eating soy foods seems to be safe for breast cancer survivors and might be helpful for some women, although it's not clear if it can help relieve menopause symptoms. Women can get higher doses of phytoestrogens in some dietary supplements (such as soy or isoflavone supplements). However, not enough information is available on these supplements to know for sure if they are safe and if they work. If you are considering taking one of these supplements, be sure to talk with your cancer care team first.

Non-hormone medicines: Drugs without hormone properties that may be helpful in treating hot flashes include:

- The antidepressant venlafaxine (Effexor)
- The blood pressure drug clonidine
- The nerve drug gabapentin (Neurontin)

If you are taking tamoxifen, it's important to note that some antidepressants may interact with tamoxifen and could make it less effective. Ask your doctor about any possible interactions between tamoxifen and any drugs you are taking.

Acupuncture: Some research has suggested that acupuncture might be helpful in treating hot flashes.

Second cancers after breast cancer

Women who've had breast cancer can still get other cancers, although most don't get cancer again. Breast cancer survivors are at higher risk for getting another breast cancer, as well as some other types of cancer.

Breast cancer survivors can be affected by a number of health problems, but often a major concern is facing cancer again. Cancer that comes back after treatment is called a

recurrence. But some cancer survivors develop a new, unrelated cancer later. This is called a *second cancer*.

Unfortunately, being treated for breast cancer doesn't mean you can't get another cancer. Women who have had breast cancer can still get the same types of cancers that other women get. In fact, they might be at higher risk for certain types of cancer. This can be due to a number of factors, such as:

- A woman's genes, some of which might increase her risk for both breast and certain other cancers
- Having other factors that increase her risk of both breast and other cancers
- Possible increased risks from previous cancer treatments (such as radiation therapy, chemotherapy, or hormone therapy)

Women who have had breast cancer have an increased risk of:

- A second breast cancer (This is different from the first cancer coming back.)
- Salivary gland cancer
- Esophagus cancer
- Stomach cancer
- Colon cancer
- Uterine cancer
- Ovarian cancer
- Thyroid cancer
- Soft tissue cancer (sarcoma)
- Melanoma of the skin
- Acute myeloid leukemia (AML)

The most common second cancer in survivors of breast cancer is another breast cancer. The new cancer can occur in the opposite breast, as well as in the same breast for women who were treated with breast-conserving surgery (such as a lumpectomy). The risk of a second breast cancer is increased no matter which treatments a woman has had. This means factors like genetics or hormonal risk factors might play a role in these cancers.

For some other second cancers, shared genetic risk factors may also play a role. For example, women with mutations in the *BRCA* genes have a high increased risk of both breast cancer and ovarian cancer.

Cancers linked to radiation treatment

Lung cancer: The risk of lung cancer is not increased in all women who have had breast cancer, but it is higher in women who had radiation therapy as part of their treatment. The

increased risk is first seen about 10 years after radiation and gets higher over time. The risk of lung cancer after radiation is even higher in women who smoke.

Sarcoma: Radiation therapy to the breast also increases the risk of sarcomas of blood vessels (angiosarcomas), bone (osteosarcomas), and other connective tissues. These cancers are most often seen in the remaining breast area, chest wall, or arm that had been treated with the radiation therapy. This risk remains higher even 30 years after treatment.

Certain blood cancers: Breast radiation is linked to a higher risk of leukemia and myelodysplastic syndrome. Overall, though, the risk is low – less than half a percent.

Cancers linked to chemotherapy

There is a small increased risk of developing leukemia and myelodysplastic syndrome after chemotherapy (chemo) for early breast cancer. The risk is higher if both chemo and radiation therapy are given. Some studies have found the highest risk in patients treated with chemo drugs known as alkylating agents, such as cyclophosphamide (Cytosan). The risk goes up as the amount of the drug given goes up and as dose intensity increases (when doses of the drug are given closer together).

Cancers linked to treatment with tamoxifen

Taking tamoxifen lowers the chance of hormone receptor-positive breast cancer coming back. It also lowers the risk of a second breast cancer. Tamoxifen does, however, increase the risk for uterine cancer (endometrial cancer and uterine sarcoma). Still, the overall risk of uterine cancer in most women taking tamoxifen is low, and studies have shown that the benefits of this drug in treating breast cancer are greater than the risk of a second cancer.

Follow-up care

After completing treatment for breast cancer, you should still see your doctor regularly to look for signs that the cancer has come back or spread. See “Living as a breast cancer survivor” for more on the types of tests you might need after treatment.

You should also follow the American Cancer Society guidelines for the early detection of cancer, such as those for lung, colorectal cancer, and cervical cancer. Screening tests can often find these cancers early, when they are likely to be easier to treat. In some cases, the tests might even help prevent these cancers if pre-cancers are found and treated. For women who have had breast cancer, most experts do not recommend any additional testing to look for second cancers unless you have symptoms.

Let your doctor know about any new symptoms or problems, because they could be caused by the breast cancer coming back or by a new disease or second cancer. For

example, abnormal menstrual bleeding, such as bleeding or spotting after menopause or between periods, can be a symptom of uterine cancer.

Can I lower my risk of getting a second cancer?

It's not possible to prevent all cancers, but there are steps you can take to lower your risk and stay as healthy as possible. Getting the recommended early detection tests, as mentioned above, is one way to do this.

Women who have had breast cancer should do their best to stay away from tobacco products. Smoking increases the risk of many cancers and might further increase the risk of some of the second cancers seen after breast cancer.

To help maintain good health, breast cancer survivors should also:

- Get to and stay at a healthy weight
- Keep physically active
- Eat a healthy diet, with an emphasis on plant foods
- Limit alcohol to no more than 1 drink per day

These steps may also lower the risk of some other health problems.

See *Second Cancers in Adults* for more information about causes of second cancers.

Can I lower my risk of breast cancer progressing or coming back?

If you have (or have had) breast cancer, you probably want to know if there are things you can do that might lower your risk of the cancer growing or coming back, such as exercising, eating a certain type of diet, or taking nutritional supplements. Fortunately, breast cancer is one of the best studied types of cancer in this regard, and research has shown there are some things you can do that might be helpful.

Getting to a healthy weight

If you have had breast cancer, getting to and staying at a healthy weight might help lower your risk. A lot of research suggests that being overweight or obese (very overweight) raises the risk of breast cancer coming back. It has also been linked with a higher risk of getting lymphedema, as well as a higher risk of dying from breast cancer.

However, there is less research to show whether losing weight during or after treatment can actually lower the risk of breast cancer recurrence. Large studies are now looking at

this issue. This is complicated by the fact that many women gain weight (without trying) during breast cancer treatment, which itself might increase risk.

Of course, for women who are overweight, getting to a healthy weight can also have other health benefits. For example, weight loss has been shown to improve quality of life and physical functioning among overweight breast cancer survivors. Getting to a healthy weight might also lower your risk of getting some other cancers (including a new breast cancer), as well as some other chronic diseases.

Because of the possible health benefits of losing weight, many health care providers now encourage women who are overweight to get to and stay at a healthy weight. Still, it's important to discuss this with your doctor before trying to lose weight, especially if you are still getting treatment or have just finished it. Your health care team can help you create a plan to lose weight safely.

Being physically active

Research suggests that women who get regular physical activity after treatment may live longer than those who don't. Among breast cancer survivors, studies have found a consistent link between physical activity and a lower risk of breast cancer recurrence and of dying from breast cancer. Physical activity has also been linked to improvements in quality of life, physical functioning, and fewer fatigue symptoms.

It's not clear exactly how much activity might be needed, but more seems to be better. More vigorous activity may also be more helpful than less vigorous activity. But further studies are needed to follow up on these findings.

Some people used to think that breast cancer survivors with lymphedema should avoid certain arm exercises and vigorous activities. But studies have found that such physical activity is safe. In fact, it might actually lower the risk of lymphedema, or improve lymphedema for women who already have it.

As with other types of lifestyle changes, it's important to talk with your treatment team before starting a new physical activity program. This will likely include meeting with a physical therapist as well. Your team can help you plan a program that can be both safe and effective for you.

Eating a healthy diet

Most research on possible links between diet and breast cancer recurrence risk has looked at broad dietary patterns, rather than specific foods. In general, it's not clear if eating any specific type of diet can help lower your risk of breast cancer coming back. Studies have found that breast cancer survivors who eat diets high in vegetables, fruits, whole grains, chicken, and fish tend to live longer than those who eat diets that have more refined sugars, fats, red meats (such as beef, pork, and lamb), and processed meats (such as

bacon, sausage, luncheon meats, and hot dogs). But it's not clear if this is due to effects on breast cancer or possibly to other health benefits of eating a healthy diet.

Two large studies (known as WINS and WHEL) have looked at the effects of lowering fat intake after being diagnosed with early stage breast cancer. One study found that women on a low-fat diet had a small reduction in the risk of cancer recurrence, but these women had also lost weight as a result of their diet, which might have affected the results. The other study did not find a link between a diet low in fat and the risk of recurrence.

Many women have questions about whether soy products are safe to eat after a diagnosis of breast cancer. Soy foods are rich sources of compounds called *isoflavones* that can have estrogen-like properties in the body. However, some recent large studies have not found that soy food intake affects breast cancer recurrence or survival rates. While eating soy foods doesn't seem to pose a risk, the evidence regarding the effects of taking soy or isoflavone supplements is not as clear.

While the links between specific types of diets and breast cancer recurrence are not certain, there are clearly health benefits to eating well. For example, diets that are rich in plant sources are often an important part of getting to and staying at a healthy weight. Eating a healthy diet can also help lower your risk for some other health problems, such as heart disease and diabetes.

Dietary supplements

Women often want to know if there are any dietary or nutritional supplements they can take to help lower their risk. So far, no dietary supplements have been shown to clearly help lower the risk of breast cancer progressing or coming back. This doesn't mean that none will help, but it's important to know that none have been proven to do so.

Dietary supplements are not regulated like medicines in the United States – they do not have to be proven effective (or even safe) before being sold, although there are limits on what they're allowed to claim they can do. If you are thinking about taking any type of nutritional supplement, talk to your health care team. With good information and the support of your health care team, you may be able to safely use those that might help you while avoiding those that could be harmful.

Alcohol

It's clear that alcohol – even as little as a few drinks a week – increases a woman's risk of *getting* breast cancer. But whether alcohol affects the risk of breast cancer *recurrence* is not as clear. Drinking alcohol can raise the levels of estrogen in the body, which in theory could increase the risk of breast cancer coming back. But there is no strong evidence from studies to support this.

As part of its guidelines on nutrition and physical activity for cancer prevention, the American Cancer Society recommends that women who drink alcohol limit their intake to no more than 1 drink a day to help lower their risk of getting certain types of cancer (including breast cancer). But for women who have completed cancer treatment, the effects of alcohol on cancer recurrence risk are largely unknown. This issue is complicated by the fact that low to moderate alcohol use (1 drink a day or less) has been linked with a lower risk of heart disease.

Because this issue is complex, it's important to discuss it with your health care team, taking into account your risk of breast cancer recurrence (or getting a new breast cancer), your risk of heart disease, and your risk of other health issues linked to alcohol use.

What's new in breast cancer research and treatment?

Researchers around the world are working to find better ways to prevent, detect, and treat breast cancer, and to improve the quality of life of patients and survivors. Some of the many active areas of research include:

- Breast cancer causes
- Reducing breast cancer risk
- Managing DCIS
- New lab tests for breast cancer
- New imaging tests for breast cancer
- Breast cancer treatment

Causes of breast cancer

Studies continue to uncover lifestyle factors and habits, as well as inherited genes, that affect breast cancer risk. Here are a few examples:

- Several studies are looking at the effect of exercise, weight gain or loss, and diet on risk.
- Studies on the best use of genetic testing for *BRCA1* and *BRCA2* mutations continue at a rapid pace.
- Scientists are exploring how common gene variations (small changes in genes that are not as significant as mutations) may affect breast cancer risk. Gene variants typically

have only a modest effect on risk, but when taken together they may potentially have a large impact.

- Potential causes of breast cancer in the environment have also received more attention in recent years. While much of the science on this topic is still in its earliest stages, this is an area of active research.
- A large, long-term study funded by the National Institute of Environmental Health Sciences (NIEHS) is now being done to help find the causes of breast cancer. Known as the Sister Study, it has enrolled 50,000 women who have sisters with breast cancer. This study will follow these women for at least 10 years and collect information about genes, lifestyle, and environmental factors that may cause breast cancer. An offshoot of the Sister Study, the Two Sister Study, is designed to look at possible causes of early onset breast cancer. To find out more about these studies, call 1-877-4-SISTER (1-877-474-7837) or visit the Sister Study website (www.sisterstudy.org).

Reducing breast cancer risk

Researchers continue to look for medicines that might help lower breast cancer risk, especially in women who are at high risk.

- Hormone therapy drugs are typically used to help treat breast cancer, but some might also help prevent it. Two drugs, tamoxifen and raloxifene, are already approved for this purpose, although concerns about side effects have limited their use. Aromatase inhibitors such as exemestane, anastrozole, and letrozole are also being studied to reduce the risk of breast cancer.
- Fenretinide, a drug related to vitamin A, is also being studied as a way to reduce the risk of breast cancer. In a small study, this drug reduced breast cancer risk as much as tamoxifen.
- Other clinical trials are looking at breast cancer reduction as an unintended effect of drugs used for other reasons. Drugs currently being researched include bisphosphonates (drugs for osteoporosis), and statins (such as atorvastatin and lovastatin), which are used to lower cholesterol.
- Dietary supplements are also being studied to see if they can reduce breast cancer risk. These have included grapeseed extract, folate, omega-3 fatty acids, and vitamins B6 and B12. Although some human studies of these supplements have been completed, very little has been published in the available medical literature to date.
- Other supplements now being studied include hydroxytyrosol (a component in olive oil), curcumin, and omega-3 fatty acids (coupled with weight loss).

This type of research takes many years. It might be some time before meaningful results on any of these compounds are available.

Managing DCIS

In ductal carcinoma in situ (DCIS), the abnormal cells are just in the top layers of cells in the ducts within the breast and haven't invaded any deeper. In some women, DCIS turns into invasive breast cancer, or sometimes an area of DCIS contains invasive cancer. In some women, though, the cells just stay within the ducts and never invade deeper or spread to lymph nodes or other organs. The uncertainty about how DCIS will behave can make it hard to choose the best treatments. Researchers are looking for ways to help with these challenges.

Researchers are studying the use of computers and statistical methods to estimate the odds that a woman's DCIS will become invasive. Some of these methods are based on routinely available clinical information about the patient and her DCIS, while others also include information about changes in the genes in her tumor cells. Decision aids are another approach. They ask a woman with DCIS questions that help her decide which factors (such as survival, preventing recurrence, and side effects) she considers most important in choosing a treatment.

Another approach is to look at genes expressed by the DCIS cells using a test such as the Oncotype Dx DCIS Score. This test can be used to predict a woman's chance of DCIS coming back or a new cancer developing in the same breast if she does not get radiation. So far, though, it hasn't been studied well enough to predict how much someone would benefit from radiation after surgery for DCIS.

Another recent area of research and debate among breast cancer specialists is whether changing the name of DCIS to one that emphasizes that this is not an invasive cancer could help some women avoid overly aggressive treatment.

Newer lab tests

Tests for circulating tumor cells (CTCs)

Researchers have found that in many women with breast cancer, cells may break away from the tumor and enter the blood. These circulating tumor cells can be detected with sensitive lab tests. Although these tests can help predict which patients may go on to have their cancer come back, it isn't clear that the use of these tests can help patients live longer. For women with advanced breast cancer, these tests may potentially help to tell if treatments are working.

Newer imaging tests

Newer imaging methods are now being studied for evaluating abnormalities that may be breast cancers.

Scintimammography (molecular breast imaging)

In this test, a slightly radioactive drug called a *tracer* is injected into a vein. The tracer attaches to breast cancer cells and is detected by a special camera.

This technique is still being studied to see if it will be useful in finding breast cancers. Some doctors believe it may be helpful in looking at suspicious areas found by regular mammograms, but its exact role is still unclear. Current research is aimed at improving the technology and evaluating its use in specific situations such as in the dense breasts of younger women. Some early studies have suggested that it may be almost as accurate as more expensive magnetic resonance imaging (MRI) scans. At this time, however, scintimammography should not be used as a replacement for screening mammograms.

Treatment

Oncoplastic surgery

Breast-conserving surgery (lumpectomy or partial mastectomy) can often be used for early-stage breast cancers. But for some women, it can result in breasts of different sizes and/or shapes. If the tumor is larger, it might not even be possible, and a mastectomy might be needed instead. Some doctors are addressing this problem by combining cancer surgery and plastic surgery techniques, known as *oncoplastic surgery*. This typically involves reshaping the breast at the time of the initial surgery, and may mean operating on the other breast as well to make them more alike. This approach is still fairly new, and not all doctors are comfortable with it.

Targeted therapy drugs

Targeted therapies are a group of newer drugs that specifically target gene changes in cancer cells that help the cells grow or spread.

Some types of targeted therapy drugs are already being used to treat breast cancer, including:

- **Drugs that target HER2**, including trastuzumab (Herceptin), pertuzumab (Perjeta), ado-trastuzumab emtansine (Kadcyla), and lapatinib (Tykerb)
- **Drugs that help hormone therapy work better**, such as palbociclib (Ibrance) and everolimus (Afinitor)

Many other types of targeted therapies are now being studied for use against breast cancer, including:

PARP inhibitors: These drugs are most likely to be helpful against cancers caused by *BRCA* mutations, which include some breast cancers. These drugs have shown some

promise in early clinical trials treating some types of breast and other cancers. Further studies are being done to determine when these drugs might be most helpful.

Anti-angiogenesis drugs: For cancers to grow, blood vessels must develop to nourish the cancer cells. This process is called angiogenesis. Looking at angiogenesis in breast cancer samples might help predict prognosis. Although one drug that blocks angiogenesis, known as bevacizumab (Avastin), turned out to not be very helpful in treating advanced breast cancer, this approach still may prove useful in breast cancer treatment. Several other anti-angiogenesis drugs are being tested in clinical trials.

Other targeted drugs: Other potential targets for new breast cancer drugs have been identified in recent years. Drugs based on these targets are now being studied, but most are still in the early stages of clinical trials.

Bone-directed treatments

If breast cancer spreads, it often goes to the bones. Some drugs can help treat the spread of cancer to the bones, and might even help prevent it.

Bisphosphonates: These drugs are used to help strengthen and reduce the risk of fractures in bones that have been weakened by metastatic breast cancer. Examples include pamidronate (Aredia) and zoledronic acid (Zometa).

Some studies have suggested that zoledronic acid may help other treatments, such as hormone therapy and chemo, work better. In one study of women being treated with chemo before surgery, tumors in the women getting zoledronic acid with chemo shrank more than those in the women treated with chemo alone.

Other studies have looked at the effect of giving zoledronic acid with other adjuvant treatments (like chemo or hormone therapy). Some studies have shown that this approach helped lower the risk of the cancer coming back, but others did not. The results of one study linked the use of these drugs with adjuvant chemo with an increased risk of breast cancer recurrence in younger women. Overall, the data does not support making bisphosphonates part of standard therapy for early-stage breast cancer.

Denosumab (Xgeva): This drug can also be used to help strengthen and reduce the risk of fractures in bones that have been weakened by metastatic breast cancer. It is being studied to see if it can help adjuvant treatments work better.

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Last Medical Review: 6/1/2016

Last Revised: 9/13/2016

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