

National Cancer Institute

What You Need
To Know About™

Breast Cancer

**U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES**

National Institutes of Health

National Cancer Institute Services

This is only one of many free booklets for people with cancer.

You may want more information for yourself, your family, and your doctor.

The NCI offers comprehensive research-based information for patients and their families, health professionals, cancer researchers, advocates, and the public.

- **Call** the NCI Cancer Information Service at **1-800-4-CANCER (1-800-422-6237)**
- **Visit** us at **<http://www.cancer.gov>** or **<http://www.cancer.gov/espanol>**
- **Chat** using **LiveHelp**, NCI's instant messaging service, at **<http://www.cancer.gov/livehelp>**
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About This Booklet

This National Cancer Institute (NCI) booklet is about *cancer** of the breast. Breast cancer is the most common type of cancer among women in the United States (other than skin cancer). Each year in the United States, more than 192,000 women are diagnosed with breast cancer.

Breast cancer also develops in men. Each year, about 2,000 men in this country learn they have breast cancer. Most information in this booklet applies to both women and men with breast cancer.

You can get more specific information about breast cancer in men on the NCI Web site at <http://www.cancer.gov/cancertopics/types/breast> and from the NCI Cancer Information Service at **1-800-4-CANCER (1-800-422-6237)**.

This booklet tells about diagnosis, treatment choices by stage, breast reconstruction, and follow-up care. It also describes how to take part in research studies. Learning about medical care for breast cancer can help you take an active part in making choices about your care.

This booklet has lists of questions that you may want to ask your doctor. Many people find it helpful to take a list of questions to a doctor visit. To help remember what your doctor says, you may want to take notes. You

*Words in *italics* are in the Dictionary on page 48. The Dictionary explains these terms. It also shows how to pronounce them.

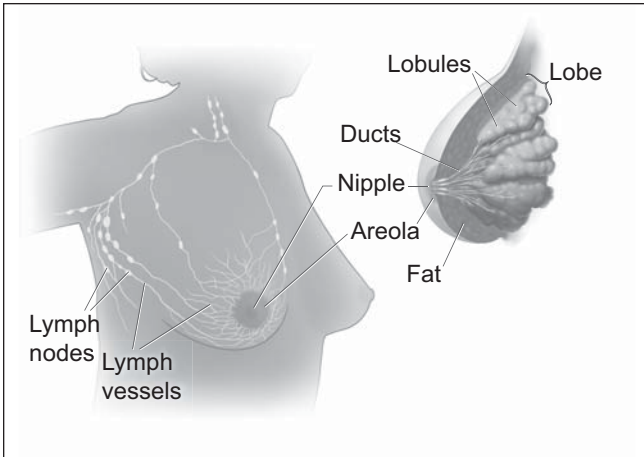
may also want to have a family member or friend go with you when you talk with the doctor—to take notes, ask questions, or just listen.

For the latest information about breast cancer, please visit our Web site at <http://www.cancer.gov/cancertopics/types/breast>. Also, the NCI Cancer Information Service can answer your questions about breast cancer. We can also send you NCI booklets and fact sheets. Call **1-800-4-CANCER (1-800-422-6237)** or instant message us through the **LiveHelp** service at <http://www.cancer.gov/help>.

The Breasts

Inside a woman's breast are 15 to 20 sections called *lobes*. Each lobe is made of many smaller sections called *lobules*. Lobules have groups of tiny *glands* that can make milk. After a baby is born, a woman's breast milk flows from the lobules through thin tubes called *ducts* to the nipple. Fat and *fibrous tissue* fill the spaces between the lobules and ducts.

The breasts also contain *lymph vessels*. These vessels are connected to small, round masses of tissue called *lymph nodes*. Groups of lymph nodes are near the breast in the underarm (*axilla*), above the collarbone, and in the chest behind the breastbone.



This picture shows the lobes and ducts inside the breast. It also shows the lymph nodes near the breast.

Cancer Cells

Cancer begins in *cells*, the building blocks that make up tissues. Tissues make up the breasts and other parts of the body.

Normal cells grow and divide to form new cells as the body needs them. When normal cells grow old or get damaged, they die, and new cells take their place.

Sometimes, this process goes wrong. New cells form when the body doesn't need them, and old or damaged cells don't die as they should. The buildup of extra cells often forms a mass of tissue called a lump, growth, or *tumor*.

Tumors in the breast can be *benign* (not cancer) or *malignant* (cancer). Benign tumors are not as harmful as malignant tumors:

- **Benign tumors:**

- are rarely a threat to life
- can be removed and usually don't grow back
- don't invade the tissues around them
- don't spread to other parts of the body

- **Malignant tumors:**

- may be a threat to life
- often can be removed but sometimes grow back
- can invade and damage nearby organs and tissues (such as the chest wall)
- can spread to other parts of the body

Breast cancer cells can spread by breaking away from the original tumor. They enter blood vessels or lymph vessels, which branch into all the tissues of the body. The cancer cells may be found in lymph nodes near the breast. The cancer cells may attach to other tissues and grow to form new tumors that may damage those tissues.

The spread of cancer is called *metastasis*. See the Staging section on page 14 for information about breast cancer that has spread.

Risk Factors

When you're told that you have breast cancer, it's natural to wonder what may have caused the disease. But no one knows the exact causes of breast cancer. Doctors seldom know why one woman develops breast cancer and another doesn't.

Doctors do know that bumping, bruising, or touching the breast does not cause cancer. And breast cancer is not contagious. You can't catch it from another person.

Doctors also know that women with certain *risk factors* are more likely than others to develop breast cancer. A risk factor is something that may increase the chance of getting a disease.

Some risk factors (such as drinking alcohol) can be avoided. But most risk factors (such as having a family history of breast cancer) can't be avoided.

Studies have found the following risk factors for breast cancer:

- **Age:** The chance of getting breast cancer increases as you get older. Most women are over 60 years old when they are diagnosed.
- **Personal health history:** Having breast cancer in one breast increases your risk of getting cancer in your other breast. Also, having certain types of abnormal breast cells (*atypical hyperplasia*, *lobular carcinoma in situ* [LCIS], or *ductal carcinoma in situ* [DCIS]) increases the risk of *invasive breast cancer*. These conditions are found with a breast *biopsy*.
- **Family health history:** Your risk of breast cancer is higher if your mother, father, sister, or daughter had breast cancer. The risk is even higher if your family member had breast cancer before age 50. Having other relatives (in either your mother's or father's family) with breast cancer or *ovarian cancer* may also increase your risk.
- **Certain genome changes:** Changes in certain *genes*, such as *BRCA1* or *BRCA2*, substantially increase the risk of breast cancer. Tests can sometimes show the presence of these rare, specific

gene changes in families with many women who have had breast cancer, and health care providers may suggest ways to try to reduce the risk of breast cancer or to improve the detection of this disease in women who have these genetic changes.

Also, researchers have found specific regions on certain *chromosomes* that are linked to the risk of breast cancer. If a woman has a genetic change in one or more of these regions, the risk of breast cancer may be slightly increased. The risk increases with the number of genetic changes that are found. Although these genetic changes are more common among women than BRCA1 or BRCA2, the risk of breast cancer is far lower.

- **Radiation therapy to the chest:** Women who had radiation therapy to the chest (including the breasts) before age 30 are at an increased risk of breast cancer. This includes women treated with radiation for *Hodgkin lymphoma*. Studies show that the younger a woman was when she received radiation treatment, the higher her risk of breast cancer later in life.
- **Reproductive and menstrual history:**
 - The older a woman is when she has her first child, the greater her chance of breast cancer.
 - Women who never had children are at an increased risk of breast cancer.
 - Women who had their first *menstrual period* before age 12 are at an increased risk of breast cancer.
 - Women who went through *menopause* after age 55 are at an increased risk of breast cancer.
 - Women who take *menopausal hormone therapy* for many years have an increased risk of breast cancer.

- **Race:** In the United States, breast cancer is diagnosed more often in white women than in African American/black, Hispanic/Latina, Asian/Pacific Islander, or American Indian/Alaska Native women.
- **Breast density:** Breasts appear on a *mammogram* (breast *x-ray*) as having areas of dense and fatty (not dense) tissue. Women whose mammograms show a larger area of dense tissue than the mammograms of women of the same age are at increased risk of breast cancer.
- **History of taking *DES*:** DES was given to some pregnant women in the United States between about 1940 and 1971. (It is no longer given to pregnant women.) Women who took DES during pregnancy may have a slightly increased risk of breast cancer. The possible effects on their daughters are under study.
- **Being overweight or obese after menopause:** The chance of getting breast cancer after menopause is higher in women who are overweight or obese.
- **Lack of physical activity:** Women who are physically inactive throughout life may have an increased risk of breast cancer.
- **Drinking alcohol:** Studies suggest that the more alcohol a woman drinks, the greater her risk of breast cancer.

Having a risk factor does not mean that a woman will get breast cancer. Most women who have risk factors never develop breast cancer.

Many other possible risk factors have been studied. For example, researchers are studying whether women who have a diet high in fat or who are exposed to certain substances in the environment have an increased risk of breast cancer. Researchers continue to study these and other possible risk factors.

Symptoms

Early breast cancer usually doesn't cause symptoms. But as the tumor grows, it can change how the breast looks or feels. The common changes include:

- A lump or thickening in or near the breast or in the underarm area
- A change in the size or shape of the breast
- Dimpling or puckering in the skin of the breast
- A nipple turned inward into the breast
- Discharge (fluid) from the nipple, especially if it's bloody
- Scaly, red, or swollen skin on the breast, nipple, or *areola* (the dark area of skin at the center of the breast). The skin may have ridges or pitting so that it looks like the skin of an orange.

You should see your health care provider about any symptom that does not go away. Most often, these symptoms are not due to cancer. Another health problem could cause them. If you have any of these symptoms, you should tell your health care provider so that the problems can be diagnosed and treated.

Detection and Diagnosis

Your doctor can check for breast cancer before you have any symptoms. During an office visit, your doctor will ask about your personal and family medical history. You'll have a physical exam. Your doctor may order one or more imaging tests, such as a mammogram.

Doctors recommend that women have regular *clinical breast exams* and mammograms to find breast cancer early. Treatment is more likely to work well when breast cancer is detected early.

You may want to read the NCI booklet *Understanding Breast Changes*. It describes types of breast changes and tests used to find changes.

Clinical Breast Exam

During a clinical breast exam, your health care provider checks your breasts. You may be asked to raise your arms over your head, let them hang by your sides, or press your hands against your hips.

Your health care provider looks for differences in size or shape between your breasts. The skin of your breasts is checked for a rash, dimpling, or other abnormal signs. Your nipples may be squeezed to check for fluid.

Using the pads of the fingers to feel for lumps, your health care provider checks your entire breast, underarm, and collarbone area. A lump is generally the size of a pea before anyone can feel it. The exam is done on one side and then the other. Your health care provider checks the lymph nodes near the breast to see if they are enlarged.

If you have a lump, your health care provider will feel its size, shape, and texture. Your health care provider will also check to see if the lump moves easily. Benign lumps often feel different from cancerous ones. Lumps that are soft, smooth, round, and movable are likely to be benign. A hard, oddly shaped lump that feels firmly attached within the breast is more likely to be cancer, but further tests are needed to diagnose the problem.

Mammogram

A mammogram is an x-ray picture of tissues inside the breast. Mammograms can often show a breast lump before it can be felt. They also can show a cluster of tiny specks of *calcium*. These specks are called *microcalcifications*. Lumps or specks can be from cancer, *precancerous* cells, or other conditions. Further tests are needed to find out if abnormal cells are present.

Before they have symptoms, women should get regular *screening mammograms* to detect breast cancer early:

- Women in their 40s and older should have mammograms every 1 or 2 years.
- Women who are younger than 40 and have risk factors for breast cancer should ask their health care provider whether to have mammograms and how often to have them.

If the mammogram shows an abnormal area of the breast, your doctor may order clearer, more detailed images of that area. Doctors use *diagnostic mammograms* to learn more about unusual breast changes, such as a lump, pain, thickening, nipple discharge, or change in breast size or shape. Diagnostic mammograms may focus on a specific area of the breast. They may involve special techniques and more views than screening mammograms.

To learn more about mammograms, you may want to read the NCI fact sheet *Mammograms*.



Other Imaging Tests

If an abnormal area is found during a clinical breast exam or with a mammogram, the doctor may order other imaging tests:

- **Ultrasound:** A woman with a lump or other breast change may have an ultrasound test. An ultrasound device sends out sound waves that people can't hear. The sound waves bounce off breast tissues. A computer uses the echoes to create a picture. The picture may show whether a lump is solid, filled with fluid (a *cyst*), or a mixture of both. Cysts usually are not cancer. But a solid lump may be cancer.
- **MRI:** MRI uses a powerful magnet linked to a computer. It makes detailed pictures of breast tissue. These pictures can show the difference between normal and diseased tissue.

Biopsy

A biopsy is the removal of tissue to look for cancer cells. A biopsy is the only way to tell for sure if cancer is present.

You may need to have a biopsy if an abnormal area is found. An abnormal area may be felt during a clinical breast exam but not seen on a mammogram. Or an abnormal area could be seen on a mammogram but not be felt during a clinical breast exam. In this case, doctors can use imaging procedures (such as a mammogram, an ultrasound, or MRI) to help see the area and remove tissue.

Your doctor may refer you to a *surgeon* or breast disease specialist for a biopsy. The surgeon or doctor will remove fluid or tissue from your breast in one of several ways:

- ***Fine-needle aspiration biopsy:*** Your doctor uses a thin needle to remove cells or fluid from a breast lump.
- ***Core biopsy:*** Your doctor uses a wide needle to remove a sample of breast tissue.
- ***Skin biopsy:*** If there are skin changes on your breast, your doctor may take a small sample of skin.
- ***Surgical biopsy:*** Your surgeon removes a sample of tissue.
 - An *incisional biopsy* takes a part of the lump or abnormal area.
 - An *excisional biopsy* takes the entire lump or abnormal area.

A *pathologist* will check the tissue or fluid removed from your breast for cancer cells. If cancer cells are found, the pathologist can tell what kind of cancer it is. The most common type of breast cancer is ductal *carcinoma*. It begins in the cells that line the breast ducts. Lobular carcinoma is another type. It begins in the lobules of the breast.

Lab Tests with Breast Tissue

If you are diagnosed with breast cancer, your doctor may order special lab tests on the breast tissue that was removed:

- **Hormone receptor tests:** Some breast tumors need hormones to grow. These tumors have receptors for the hormones *estrogen*, *progesterone*, or both. If the hormone receptor tests show that the breast tumor has these receptors, then *hormone therapy* is most often recommended as a treatment option. See the Hormone Therapy section on page 30.
- **HER2/neu test:** HER2/neu protein is found on some types of cancer cells. This test shows whether the tissue either has too much HER2/neu protein or too many copies of its gene. If the breast tumor has too much HER2/neu, then *targeted therapy* may be a treatment option. See the Targeted Therapy section on page 33.

It may take several weeks to get the results of these tests. The test results help your doctor decide which cancer treatments may be options for you.

You may want to ask your doctor these questions before having a biopsy:

- What kind of biopsy will I have? Why?
- How long will it take? Will I be awake? Will it hurt? Will I have *anesthesia*? What kind?
- Are there any risks? What are the chances of infection or bleeding after the biopsy?
- Will I have a scar?
- How soon will I know the results?
- If I do have cancer, who will talk with me about the next steps? When?

Staging

If the biopsy shows that you have breast cancer, your doctor needs to learn the extent (stage) of the disease to help you choose the best treatment. The stage is based on the size of the cancer, whether the cancer has invaded nearby tissues, and whether the cancer has spread to other parts of the body.

Staging may involve blood tests and other tests:

- **Bone scan:** The doctor injects a small amount of a *radioactive* substance into a blood vessel. It travels through the bloodstream and collects in the bones. A machine called a scanner detects and measures the radiation. The scanner makes pictures of the bones. The pictures may show cancer that has spread to the bones.
- **CT scan:** Doctors sometimes use CT scans to look for breast cancer that has spread to the liver or lungs. An x-ray machine linked to a computer takes a series of detailed pictures of your chest or abdomen. You may receive *contrast material* by injection into a blood vessel in your arm or hand. The contrast material makes abnormal areas easier to see.
- **Lymph node biopsy:** The stage often is not known until after *surgery* to remove the tumor in your breast and one or more lymph nodes under your arm. Surgeons use a method called *sentinel lymph node biopsy* to remove the lymph node most likely to have breast cancer cells. The surgeon injects a blue dye, a radioactive substance, or both near the breast tumor. Or the surgeon may inject a

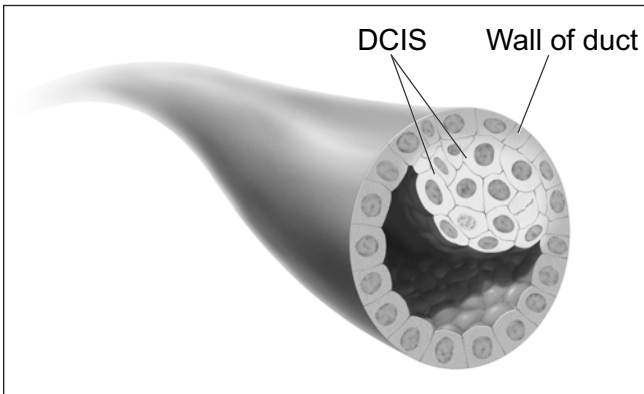
radioactive substance under the nipple. The surgeon then uses a scanner to find the sentinel lymph node containing the radioactive substance or looks for the lymph node stained with dye. The sentinel node is removed and checked for cancer cells. Cancer cells may appear first in the sentinel node before spreading to other lymph nodes and other places in the body.

These tests can show whether the cancer has spread and, if so, to what parts of your body. When breast cancer spreads, cancer cells are often found in lymph nodes under the arm (*axillary lymph nodes*). Also, breast cancer can spread to almost any other part of the body, such as the bones, liver, lungs, and brain.

When breast cancer spreads from its original place to another part of the body, the new tumor has the same kind of abnormal cells and the same name as the primary (original) tumor. For example, if breast cancer spreads to the bones, the cancer cells in the bones are actually breast cancer cells. The disease is *metastatic* breast cancer, not bone cancer. For that reason, it is treated as breast cancer, not bone cancer. Doctors call the new tumor “distant” or metastatic disease.

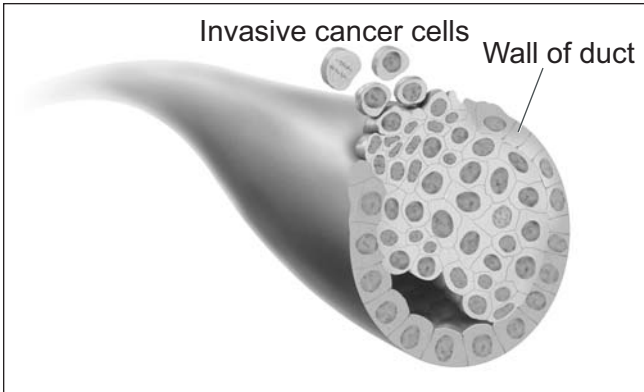
These are the stages of breast cancer:

- **Stage 0** is sometimes used to describe abnormal cells that are not invasive cancer. For example, Stage 0 is used for ductal carcinoma in situ (DCIS). DCIS is diagnosed when abnormal cells are in the lining of a breast duct, but the abnormal cells have not invaded nearby breast tissue or spread outside the duct. Although many doctors don't consider DCIS to be cancer, DCIS sometimes becomes invasive breast cancer if not treated.



This picture shows ductal carcinoma in situ.

- **Stage I** is an early stage of invasive breast cancer. Cancer cells have invaded breast tissue beyond where the cancer started, but the cells have not spread beyond the breast. The tumor is no more than 2 centimeters (three-quarters of an inch) across.



This picture shows cancer cells spreading outside the duct. The cancer cells are invading nearby tissue inside the breast.

- **Stage II** is one of the following:
 - The tumor is no more than 2 centimeters (three-quarters of an inch) across. The cancer has spread to the lymph nodes under the arm.
 - The tumor is between 2 and 5 centimeters (three-quarters of an inch to 2 inches). The cancer has not spread to the lymph nodes under the arm.
 - The tumor is between 2 and 5 centimeters (three-quarters of an inch to 2 inches). The cancer has spread to the lymph nodes under the arm.
 - The tumor is larger than 5 centimeters (2 inches). The cancer has not spread to the lymph nodes under the arm.

- **Stage III** is *locally advanced cancer*. It is divided into Stage IIIA, IIIB, and IIIC.
 - Stage IIIA** is one of the following:
 - The tumor is no more than 5 centimeters (2 inches) across. The cancer has spread to underarm lymph nodes that are attached to each other or to other structures. Or the cancer may have spread to lymph nodes behind the breastbone.
 - The tumor is more than 5 centimeters across. The cancer has spread to underarm lymph nodes that are either alone or attached to each other or to other structures. Or the cancer may have spread to lymph nodes behind the breastbone.
 - Stage IIIB** is a tumor of any size that has grown into the chest wall or the skin of the breast. It may be associated with swelling of the breast or with nodules (lumps) in the breast skin:
 - The cancer may have spread to lymph nodes under the arm.
 - The cancer may have spread to underarm lymph nodes that are attached to each other or other structures. Or the cancer may have spread to lymph nodes behind the breastbone.
 - *Inflammatory breast cancer* is a rare type of breast cancer. The breast looks red and swollen because cancer cells block the lymph vessels in the skin of the breast. When a doctor diagnoses inflammatory breast cancer, it is at least Stage IIIB, but it could be more advanced.

—**Stage III C** is a tumor of any size. It has spread in one of the following ways:

- The cancer has spread to the lymph nodes behind the breastbone and under the arm.
- The cancer has spread to the lymph nodes above or below the collarbone.
- **Stage IV** is distant metastatic cancer. The cancer has spread to other parts of the body, such as the bones or liver.
- **Recurrent cancer** is cancer that has come back after a period of time when it could not be detected. Even when the cancer seems to be completely destroyed, the disease sometimes returns because undetected cancer cells remained somewhere in your body after treatment. It may return in the breast or chest wall. Or it may return in any other part of the body, such as the bones, liver, lungs, or brain.

Treatment

Women with breast cancer have many treatment options. The treatment that's best for one woman may not be best for another.

The options are *surgery*, *radiation therapy*, *hormone therapy*, *chemotherapy*, and *targeted therapy*. You may receive more than one type of treatment. The treatment options are described on pages 22 through 35.

Surgery and radiation therapy are types of *local therapy*. They remove or destroy cancer in the breast.

Hormone therapy, chemotherapy, and targeted therapy are types of *systemic therapy*. The drug enters the bloodstream and destroys or controls cancer throughout the body.

The treatment that's right for you depends mainly on the stage of the cancer, the results of the hormone receptor tests, the result of the HER2/neu test, and your general health. Treatment options by stage are described on pages 35 through 39.

You may want to talk with your doctor about taking part in a *clinical trial*, a research study of new treatment methods. Clinical trials are an important option for women at any stage of breast cancer. See the Taking Part in Cancer Research section on page 46.

Your doctor can describe your treatment choices, the expected results, and the possible *side effects*. Because cancer therapy often damages healthy cells and tissues, side effects are common. Before treatment starts, ask your health care team about possible side effects, how to prevent or reduce these effects, and how treatment may change your normal activities.

You may want to know how you will look during and after treatment. You and your health care team can work together to develop a treatment plan that meets your medical and personal needs.

Your doctor may refer you to a specialist, or you may ask for a referral. Specialists who treat breast cancer include *surgeons*, *medical oncologists*, and *radiation oncologists*. You also may be referred to a *plastic surgeon* or *reconstructive surgeon*. Your health care team may also include an *oncology nurse* and a *registered dietitian*.

At any stage of disease, *supportive care* is available to control pain and other symptoms, to relieve the side effects of treatment, and to ease emotional concerns. Information about such care is available on the NCI Web site at <http://www.cancer.gov/cancertopics/coping> and from the NCI Cancer Information Service at 1-800-4-CANCER (1-800-422-6237) or at LiveHelp (<http://www.cancer.gov/help>).

You may want to ask your doctor these questions before you begin treatment:

- What did the hormone receptor tests show? What did other lab tests show? Would genetic testing be helpful to me or my family?
- Do any lymph nodes show signs of cancer?
- What is the stage of the disease? Has the cancer spread?
- What are my treatment choices? Which do you recommend for me? Why?
- What are the expected benefits of each kind of treatment?
- What can I do to prepare for treatment?
- Will I need to stay in the hospital? If so, for how long?
- What are the risks and possible side effects of each treatment? How can side effects be managed?
- What is the treatment likely to cost? Will my insurance cover it?
- How will treatment affect my normal activities?
- Would a research study (clinical trial) be appropriate for me?
- Can you recommend other doctors who could give me a second opinion about my treatment options?
- How often should I have checkups?

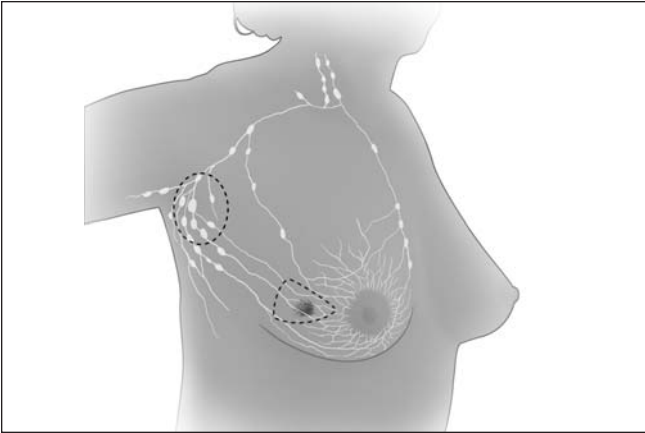
Surgery

Surgery is the most common treatment for breast cancer. (See pages 23 and 24 for pictures of the types of surgery.) Your doctor can explain each type, discuss and compare the benefits and risks, and describe how each will change the way you look:

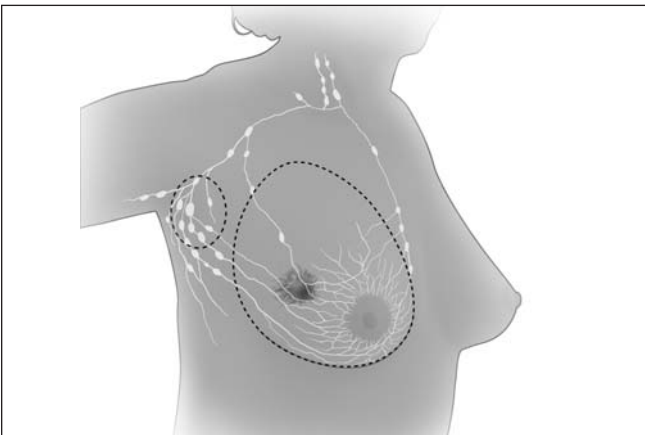
- ***Breast-sparing surgery***: This is an operation to remove the cancer but not the breast. It's also called *breast-conserving surgery*. It can be a *lumpectomy* or a *segmental mastectomy* (also called a *partial mastectomy*). Sometimes an excisional biopsy is the only surgery a woman needs because the surgeon removed the whole lump.
- ***Mastectomy***: This is an operation to remove the entire breast (or as much of the breast tissue as possible). In some cases, a skin-sparing mastectomy may be an option. For this approach, the surgeon removes as little skin as possible.

The surgeon usually removes one or more lymph nodes from under the arm to check for cancer cells. If cancer cells are found in the lymph nodes, other cancer treatments will be needed. (For more about information about lymph node biopsy, see the Staging section on page 14.)

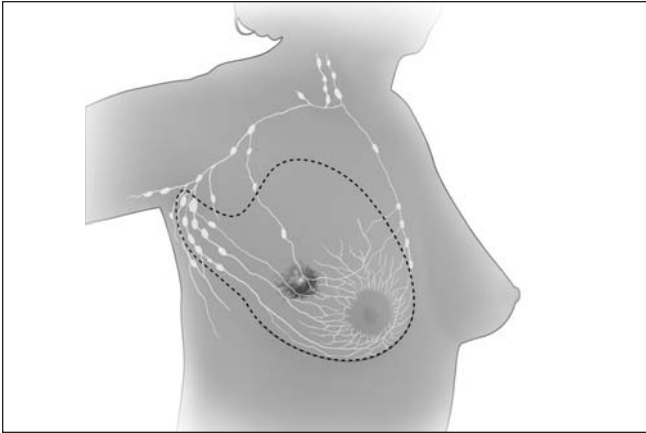
You may choose to have breast reconstruction. This is *plastic surgery* to rebuild the shape of the breast. It may be done at the same time as the cancer surgery or later. If you're considering breast reconstruction, you may wish to talk with a plastic surgeon before having cancer surgery. See the Breast Reconstruction section on page 40.



In breast-sparing surgery, the surgeon removes the cancer in the breast and some normal tissue around it. The surgeon may also remove lymph nodes under the arm. The surgeon sometimes removes some of the lining over the chest muscles below the tumor.



In *total (simple) mastectomy*, the surgeon removes the whole breast. Some lymph nodes under the arm may also be removed.



In *modified radical mastectomy*, the surgeon removes the whole breast and most or all of the lymph nodes under the arm. Often, the lining over the chest muscles is removed. A small chest muscle also may be taken out to make it easier to remove the lymph nodes.

The time it takes to heal after surgery is different for each woman. Surgery causes pain and tenderness. Medicine can help control the pain. Before surgery, you should discuss the plan for pain relief with your doctor or nurse. After surgery, your doctor can adjust the plan if you need more relief.

Any kind of surgery also carries a risk of infection, bleeding, or other problems. You should tell your health care team right away if you develop any problems.

You may feel off balance if you've had one or both breasts removed. You may feel more off balance if you have large breasts. This imbalance can cause discomfort in your neck and back.

Also, the skin where your breast was removed may feel tight. Your arm and shoulder muscles may feel stiff and weak. These problems usually go away. The doctor, nurse, or *physical therapist* can suggest exercises to help you regain movement and strength in your arm and shoulder. Exercise can also reduce stiffness and pain. You may be able to begin gentle exercise within days of surgery.

Because nerves may be injured or cut during surgery, you may have numbness and tingling in your chest, underarm, shoulder, and upper arm. These feelings usually go away within a few weeks or months. But for some women, numbness does not go away.

Removing the lymph nodes under the arm slows the flow of lymph fluid. The fluid may build up in your arm and hand and cause swelling. This swelling is called *lymphedema*. It can develop soon after surgery or months or even years later. You'll always need to protect the arm and hand on the treated side of your body from cuts, burns, or other injuries. Information about preventing and treating lymphedema is available on the NCI Web site at <http://www.cancer.gov/cancertopics/coping> and from Information Specialists at 1-800-4-CANCER (1-800-422-6237) or *LiveHelp* (<http://www.cancer.gov/help>).

You may want to ask your doctor these questions before having surgery:

- What kinds of surgery can I consider? Is breast-sparing surgery an option for me? Is a skin-sparing mastectomy an option? Which operation do you recommend for me? Why?
- Will any lymph nodes be removed? How many? Why?
- How will I feel after the operation? Will I have to stay in the hospital?
- Will I need to learn how to take care of myself or my incision when I get home?
- Where will the scars be? What will they look like?
- If I decide to have plastic surgery to rebuild my breast, how and when can that be done? Can you suggest a plastic surgeon for me to contact?
- Will I have to do special exercises to help regain motion and strength in my arm and shoulder? Will a physical therapist or nurse show me how to do the exercises?
- Is there someone I can talk with who has had the same surgery I'll be having?
- How often will I need checkups?

Radiation Therapy

Radiation therapy (also called radiotherapy) uses high-energy rays to kill cancer cells. It affects cells only in the part of the body that is treated. Radiation therapy may be used after surgery to destroy breast cancer cells that remain in the area.

Doctors use two types of radiation therapy to treat breast cancer. Some women receive both types:

- ***External radiation therapy***: The radiation comes from a large machine outside the body. You will go to a hospital or clinic for treatment. Treatments are usually 5 days a week for 4 to 6 weeks. External radiation is the most common type used for breast cancer.
- ***Internal radiation therapy (implant radiation therapy or brachytherapy)***: The doctor places one or more thin tubes inside the breast through a tiny incision. A radioactive substance is loaded into the tube. The treatment session may last for a few minutes, and the substance is removed. When it's removed, no radioactivity remains in your body. Internal radiation therapy may be repeated every day for a week.

Side effects depend mainly on the dose and type of radiation. It's common for the skin in the treated area to become red, dry, tender, and itchy. Your breast may feel heavy and tight. Internal radiation therapy may make your breast look red or bruised. These problems usually go away over time.

Bras and tight clothes may rub your skin and cause soreness. You may want to wear loose-fitting cotton clothes during this time.

Gentle skin care also is important. You should check with your doctor before using any deodorants, lotions, or creams on the treated area. Toward the end of treatment, your skin may become moist and “weepy.” Exposing this area to air as much as possible can help the skin heal. After treatment is over, the skin will slowly heal. However, there may be a lasting change in the color of your skin.

You’re likely to become very tired during radiation therapy, especially in the later weeks of treatment. Resting is important, but doctors usually advise patients to try to stay active, unless it leads to pain or other problems.

You may wish to discuss with your doctor the possible long-term effects of radiation therapy. For example, radiation therapy to the chest may harm the lung or heart. Also, it can change the size of your breast and the way it looks. If any of these problems occur, your health care team can tell you how to manage them.

You may find it helpful to read the NCI booklet *Radiation Therapy and You*.

You may want to ask your doctor these questions before having radiation therapy:

- Which type of radiation therapy can I consider? Are both types an option for me?
- When will treatment start? When will it end? How often will I have treatments?
- How will I feel during treatment? Will I need to stay in the hospital? Will I be able to drive myself to and from treatment?
- What can I do to take care of myself before, during, and after treatment?
- How will we know the treatment is working?
- Will treatment harm my skin?
- How will my chest look afterward?
- Are there any lasting effects?
- What is the chance that the cancer will come back in my breast?
- How often will I need checkups?

Hormone Therapy

Hormone therapy may also be called anti-hormone treatment. If lab tests show that the tumor in your breast has hormone receptors, then hormone therapy may be an option. (See the part about Lab Tests with Breast Tissue on page 13.) Hormone therapy keeps cancer cells from getting or using the natural hormones (estrogen and progesterone) they need to grow.

Options before menopause

If you have not gone through menopause, the options include:

- **Tamoxifen:** This drug can prevent the original breast cancer from returning and also helps prevent the development of new cancers in the other breast. As treatment for metastatic breast cancer, tamoxifen slows or stops the growth of cancer cells that are in the body. It's a pill that you take every day for 5 years.

In general, the side effects of tamoxifen are similar to some of the symptoms of menopause. The most common are hot flashes and vaginal discharge. Others are irregular menstrual periods, thinning bones, headaches, fatigue, nausea, vomiting, vaginal dryness or itching, irritation of the skin around the vagina, and skin rash. Serious side effects are rare, but they include blood clots, strokes, uterine cancer, and cataracts. You may want to read the NCI fact sheet *Tamoxifen*.

- **LH-RH agonist:** This type of drug can prevent the *ovaries* from making estrogen. The estrogen level falls slowly. Examples are *leuprolide* and *goserelin*. This type of drug may be given by injection under the skin in the stomach area. Side effects include hot flashes, headaches, weight gain, thinning bones, and bone pain.

- **Surgery to remove your ovaries:** Until you go through menopause, your ovaries are your body's main source of estrogen. When the surgeon removes your ovaries, this source of estrogen is also removed. (A woman who has gone through menopause wouldn't benefit from this kind of surgery because her ovaries produce much less estrogen.) When the ovaries are removed, menopause occurs right away. The side effects are often more severe than those caused by natural menopause. Your health care team can suggest ways to cope with these side effects.

Options after menopause

If you have gone through menopause, the options include:

- ***Aromatase inhibitor:*** This type of drug prevents the body from making a form of estrogen (*estradiol*). Examples are *anastrozole*, *exemestane*, and *letrozole*. Common side effects include hot flashes, nausea, vomiting, and painful bones or joints. Serious side effects include thinning bones and an increase in cholesterol.
- ***Tamoxifen:*** Hormone therapy is given for at least 5 years. Women who have gone through menopause receive tamoxifen for 2 to 5 years. If tamoxifen is given for less than 5 years, then an aromatase inhibitor often is given to complete the 5 years. Some women have hormone therapy for more than 5 years. See page 30 for more information about tamoxifen and its possible side effects.

Chemotherapy

Chemotherapy uses drugs to kill cancer cells. The drugs that treat breast cancer are usually given through a vein (*intravenous*) or as a pill. You'll probably receive a combination of drugs.

You may receive chemotherapy in an outpatient part of the hospital, at the doctor's office, or at home. Some women need to stay in the hospital during treatment.

The side effects depend mainly on which drugs are given and how much. Chemotherapy kills fast-growing cancer cells, but the drugs can also harm normal cells that divide rapidly:

- **Blood cells:** When drugs lower the levels of healthy blood cells, you're more likely to get infections, bruise or bleed easily, and feel very weak and tired. Your health care team will check for low levels of blood cells. If your levels are low, your health care team may stop the chemotherapy for a while or reduce the dose of the drug. There are also medicines that can help your body make new blood cells.
- **Cells in hair roots:** Chemotherapy may cause hair loss. If you lose your hair, it will grow back after treatment, but the color and texture may be changed.
- **Cells that line the *digestive tract*:** Chemotherapy can cause a poor appetite, nausea and vomiting, diarrhea, or mouth and lip sores. Your health care team can give you medicines and suggest other ways to help with these problems.

Some drugs used for breast cancer can cause tingling or numbness in the hands or feet. This problem often goes away after treatment is over.

Other problems may not go away. For example, some of the drugs used for breast cancer may weaken the heart. Your doctor may check your heart before, during, and after treatment. A rare side effect of chemotherapy is that years after treatment, a few women have developed *leukemia* (cancer of the blood cells).

Some anticancer drugs can damage the ovaries. If you have not gone through menopause yet, you may have hot flashes and vaginal dryness. Your menstrual periods may no longer be regular or may stop. You may become infertile (unable to become pregnant). For women over the age of 35, this damage to the ovaries is likely to be permanent.

On the other hand, you may remain able to become pregnant during chemotherapy. Before treatment begins, you should talk with your doctor about birth control because many drugs given during the first trimester are known to cause birth defects.

You may want to read the NCI booklet *Chemotherapy and You*.

Targeted Therapy

Some women with breast cancer may receive drugs called targeted therapy. Targeted therapy uses drugs that block the growth of breast cancer cells. For example, targeted therapy may block the action of an abnormal protein (such as HER2) that stimulates the growth of breast cancer cells. (For information about HER2, see the part about Lab Tests with Breast Tissue on page 13.)

Trastuzumab (Herceptin®) or *lapatinib* (TYKERB®) may be given to a woman whose lab tests show that her breast tumor has too much HER2:

- **Trastuzumab:** This drug is given through a vein. It may be given alone or with chemotherapy. Side effects that most commonly occur during the first treatment include fever and chills. Other possible side effects include weakness, nausea, vomiting, diarrhea, headaches, difficulty breathing, and rashes. These side effects generally become less severe after the first treatment. Trastuzumab also may cause heart damage, heart failure, and serious breathing problems. Before and during treatment, your doctor will check your heart and lungs. The NCI fact sheet *Herceptin*® (*Trastuzumab*) has more information.
- **Lapatinib:** The tablet is taken by mouth. Lapatinib is given with chemotherapy. Side effects include nausea, vomiting, diarrhea, tiredness, mouth sores, and rashes. It can also cause red, painful hands and feet. Before treatment, your doctor will check your heart and liver. During treatment, your doctor will watch for signs of heart, lung, or liver problems.

You may want to read the NCI fact sheet *Targeted Cancer Therapies*.

You may want to ask your doctor these questions before having hormone therapy, chemotherapy, or targeted therapy:

- What drugs will I be taking? What will they do?
- When will treatment start? When will it end? How often will I have treatments?
- Where will I have treatment?
- What can I do to take care of myself during treatment?
- How will we know the treatment is working?
- Which side effects should I tell you about?
- Will there be long-term effects?
- How often will I need checkups?

Treatment Choices by Stage

Your treatment options depend on the stage of your disease and these factors:

- The size of the tumor in relation to the size of your breast
- The results of lab tests (such as whether the breast cancer cells need hormones to grow)
- Whether you have gone through menopause
- Your general health

Below are brief descriptions of common treatments for each stage. Other treatments may be appropriate for some women. Research studies (clinical trials) can be an option at all stages of breast cancer. See page 46 for information about cancer research studies.

Stage 0 (DCIS)

Most women with DCIS have breast-sparing surgery followed by radiation therapy. Some women instead choose to have a total mastectomy. Women with DCIS may receive tamoxifen to reduce the risk of developing invasive breast cancer.

Stages I, II, IIIA, and some IIIC

Women with Stage I, II, IIIA, or operable IIIC breast cancer may have a combination of treatments. (Operable means the cancer can be treated with surgery.)

Some may have breast-sparing surgery followed by radiation therapy to the breast. This choice is common for women with Stage I or II breast cancer. Others decide to have a mastectomy.

With either approach, women (especially those with Stage II or IIIA breast cancer) often have lymph nodes under the arm removed.

Whether or not radiation therapy is used after mastectomy depends on the extent of the cancer. If cancer cells are found in 1 to 3 lymph nodes under the arm or if the tumor in the breast is large, the doctor sometimes suggests radiation therapy after mastectomy. If cancer cells are found in more than 3 lymph nodes under the arm, the doctor usually will suggest radiation therapy after mastectomy.

The choice between breast-sparing surgery (followed by radiation therapy) and mastectomy depends on many factors:

- The size, location, and stage of the tumor
- The size of the woman's breast
- Certain features of the cancer

- How the woman feels about how surgery will change her breast
- How the woman feels about radiation therapy
- The woman's ability to travel to a radiation treatment center

You may want to read the NCI booklet *Surgery Choices for Women with Early-Stage Breast Cancer*.

Some women have chemotherapy before surgery. This is called *neoadjuvant therapy* (treatment before the main treatment). Chemotherapy before surgery may shrink a large tumor so that breast-sparing surgery is possible. Women with large Stage II or IIIA breast tumors often choose this treatment.

After surgery, many women receive *adjuvant therapy*. Adjuvant therapy is treatment given after the main treatment to lower the chance of breast cancer returning. Radiation treatment is local therapy that can kill any remaining cancer cells in and near the breast. Women may also have hormone therapy, chemotherapy, targeted therapy, or a combination. These systemic therapies can destroy cancer cells that remain anywhere in the body. They can prevent or delay the cancer from coming back in the breast or elsewhere.

You may want to read the NCI fact sheet *Adjuvant and Neoadjuvant Therapy for Breast Cancer*.

Stage IIIB and some Stage IIIC

Women with Stage IIIB (including inflammatory breast cancer) or inoperable Stage IIIC breast cancer have chemotherapy first, and then may be offered other treatments. (Inoperable means the cancer can't be treated with surgery without first shrinking the tumor.) They may also have targeted therapy.

If the chemotherapy or targeted therapy shrinks the tumor, then surgery may be possible:

- **Mastectomy:** The surgeon removes the breast. In most cases, the lymph nodes under the arm are removed. After surgery, a woman may receive radiation therapy to the chest and underarm area.
- **Breast-sparing surgery:** In rare cases, the surgeon removes the cancer but not the breast. The lymph nodes under the arm are usually removed. After surgery, a woman may receive radiation therapy to the breast and underarm area.

After surgery, the doctor will likely recommend chemotherapy, targeted therapy, hormone therapy, or a combination. This therapy may help prevent the disease from coming back in the breast or elsewhere.

Stage IV and Recurrent

Women with recurrent breast cancer will be treated based on where the cancer returned. If the cancer returned in the chest area, the doctor may suggest surgery, radiation therapy, chemotherapy, hormone therapy, or a combination.

Women with Stage IV breast cancer or recurrent cancer that has spread to the bones, liver, or other areas usually have hormone therapy, chemotherapy, targeted therapy, or a combination. Radiation therapy may be used to control tumors in certain parts of the body. These treatments are not likely to cure the disease, but they may help a woman live longer.

Many women have supportive care along with anticancer treatments. Anticancer treatments are given to slow the progress of the disease. Supportive care helps manage pain, other symptoms of cancer, or the side effects of treatment (such as nausea). This care can

help a woman feel better physically and emotionally. Supportive care does not aim to extend life. Some women with advanced cancer decide to have only supportive care.

Second Opinion

Before starting treatment, you might want a second opinion from another doctor about your diagnosis and treatment plan. Some women worry that their doctor will be offended if they ask for a second opinion. Usually the opposite is true. Most doctors welcome a second opinion. And many health insurance companies will pay for a second opinion if you or your doctor requests it. Some companies require a second opinion.

If you get a second opinion, the doctor may agree with your first doctor's diagnosis and treatment plan. Or the second doctor may suggest another approach. Either way, you'll have more information and perhaps a greater sense of control. You may also feel more confident about the decisions you make, knowing that you've looked carefully at your options.

It may take some time and effort to gather your medical records and see another doctor. Usually it's not a problem if it takes you several weeks to get a second opinion. In most cases, the delay in starting treatment will not make treatment less effective. To make sure, you should discuss this possible delay with your doctor. Some women with breast cancer need treatment right away.

There are many ways to find a doctor for a second opinion. You can ask your doctor, a local or state medical society, a nearby hospital, or a medical school for names of specialists.

The NCI Cancer Information Service at **1-800-4-CANCER (1-800-422-6237)** or at **LiveHelp (<http://www.cancer.gov/help>)** can tell you about nearby treatment centers. Other sources can be found in the NCI fact sheet *How To Find a Doctor or Treatment Facility If You Have Cancer*.

Breast Reconstruction

Some women who plan to have a mastectomy decide to have breast reconstruction. Other women prefer to wear a breast form (*prosthesis*) inside their bra. Others decide to do nothing after surgery. All of these options have pros and cons. What is right for one woman may not be right for another. What is important is that nearly every woman treated for breast cancer has choices.

Breast reconstruction may be done at the same time as the mastectomy, or later on. If radiation therapy is part of the treatment plan, some doctors suggest waiting until after radiation therapy is complete.

If you are thinking about breast reconstruction, you should talk to a plastic surgeon before the mastectomy, even if you plan to have your reconstruction later on.

There are many ways for a surgeon to reconstruct the breast. Some women choose to have breast implants, which are filled with saline or silicone gel. You can read about breast implants on the Food and Drug Administration Web site at <http://www.fda.gov/cdrh/breastimplants/>.

You also may have breast reconstruction with tissue that the plastic surgeon removes from another part of your body. Skin, muscle, and fat can come from your lower abdomen, back, or buttocks. The surgeon uses this tissue to create a breast shape.

The type of reconstruction that is best for you depends on your age, body type, and the type of cancer surgery that you had. The plastic surgeon can explain the risks and benefits of each type of reconstruction.

You may want to ask your doctor these questions about breast reconstruction:

- Which type of surgery would give me the best results? How will I look afterward?
- When can my reconstruction begin?
- How many surgeries will I need?
- What are the risks at the time of surgery? Later?
- Will I have scars? Where? What will they look like?
- If tissue from another part of my body is used, will there be any permanent changes where the tissue was removed?
- What activities should I avoid? When can I return to my normal activities?
- Will I need follow-up care?
- How much will reconstruction cost? Will my health insurance pay for it?

Nutrition and Physical Activity

It's important for you to take very good care of yourself before, during, and after cancer treatment. Taking care of yourself includes eating well and staying as active as you can.

You need the right amount of calories to maintain a good weight. You also need enough protein to keep up your strength. Eating well may help you feel better and have more energy.

Sometimes, especially during or soon after treatment, you may not feel like eating. You may be uncomfortable or tired. You may find that foods don't taste as good as they used to. In addition, the side effects of treatment (such as poor appetite, nausea, vomiting, or mouth blisters) can make it hard to eat well. On the other hand, some women treated for breast cancer may have a problem with weight gain.

Your doctor, a registered dietitian, or another health care provider can suggest ways to help you meet your nutrition needs. Also, the NCI booklet *Eating Hints* has many useful ideas and recipes.

Many women find that they feel better when they stay active. Walking, yoga, swimming, and other activities can keep you strong and increase your energy. Exercise may reduce nausea and pain and make treatment easier to handle. It also can help relieve stress. Whatever physical activity you choose, be sure to talk to your doctor before you start. Also, if your activity causes you pain or other problems, be sure to let your doctor or nurse know.

Follow-up Care

You'll need regular checkups after treatment for breast cancer. Checkups help ensure that any changes in your health are noted and treated if needed. If you have any health problems between checkups, you should contact your doctor.

Your doctor will check for return of the cancer. Also, checkups help detect health problems that can result from cancer treatment.

You should report any changes in the treated area or in your other breast to the doctor right away. Tell your doctor about any health problems, such as pain, loss of appetite or weight, changes in menstrual cycles, unusual vaginal bleeding, or blurred vision. Also talk to your doctor about headaches, dizziness, shortness of breath, coughing or hoarseness, backaches, or digestive problems that seem unusual or that don't go away. Such problems may arise months or years after treatment. They may suggest that the cancer has returned, but they can also be symptoms of other health problems. It's important to share your concerns with your doctor so that problems can be diagnosed and treated as soon as possible.

Checkups usually include an exam of the neck, underarm, chest, and breast areas. Since a new breast cancer may develop, you should have regular mammograms. You probably won't need a mammogram of a reconstructed breast or if you had a mastectomy without reconstruction. Your doctor may order other imaging procedures or lab tests.

You may find it helpful to read the NCI booklet *Facing Forward: Life After Cancer Treatment*. You may also want to read the NCI fact sheet *Follow-up Care After Cancer Treatment*.



Sources of Support

Learning that you have breast cancer can change your life and the lives of those close to you. These changes can be hard to handle. It's normal for you, your family, and your friends to need help coping with the feelings that such a diagnosis can bring.

Concerns about treatments and managing side effects, hospital stays, and medical bills are common. You may also worry about caring for your family, keeping your job, or continuing daily activities.

Several organizations offer special programs for women with breast cancer. Women who have had the disease serve as trained volunteers. They may talk with

or visit women who have breast cancer, provide information, and lend emotional support. They often share their experiences with breast cancer treatment, breast reconstruction, and recovery.

You may be afraid that changes to your body will affect not only how you look but also how other people feel about you. You may worry that breast cancer and its treatment will affect your sexual relationships. Many couples find it helps to talk about their concerns. Some find that counseling or a couples' support group can be helpful.

Here's where you can go for support:

- Doctors, nurses, and other members of your health care team can answer questions about treatment, working, or other activities.
- Social workers, counselors, or members of the clergy can be helpful if you want to talk about your feelings or concerns. Often, social workers can suggest resources for financial aid, transportation, home care, or emotional support.
- Support groups also can help. In these groups, women with breast cancer or their family members meet with other patients or their families to share what they have learned about coping with the disease and the effects of treatment. Groups may offer support in person, over the telephone, or on the Internet. You may want to talk with a member of your health care team about finding a support group.

Women with breast cancer often get together in support groups, but please keep in mind that each woman is different. Ways that one woman deals with cancer may not be right for another. You may want to ask your health care provider about advice you receive from other women with breast cancer.

- Information specialists at **1-800-4-CANCER (1-800-422-6237)** and at **LiveHelp (<http://www.cancer.gov/help>)** can help you locate programs, services, and publications. They can send you a list of organizations that offer services to women with cancer.

For tips on coping, you may want to read the NCI booklet *Taking Time: Support for People With Cancer*.

Taking Part in Cancer Research

Cancer research has led to real progress in the prevention, detection, and treatment of breast cancer. Continuing research offers hope that in the future even more women with breast cancer will be treated successfully.

Doctors all over the country are conducting many types of clinical trials (research studies in which people volunteer to take part). Clinical trials are designed to find out whether new approaches are safe and effective.

Even if the people in a trial do not benefit directly, they may still make an important contribution by helping doctors learn more about breast cancer and how to control it. Although clinical trials may pose some risks, doctors do all they can to protect their patients.

Doctors are trying to find better ways to care for women with breast cancer. They are studying many types of treatment and their combinations:

- **Radiation therapy:** In women with early breast cancer who have had a lumpectomy, doctors are comparing the effectiveness of standard radiation therapy aimed at the whole breast to that of radiation therapy aimed at a smaller part of the breast.

- **Chemotherapy and targeted therapy:** Researchers are testing new anticancer drugs and doses. They are looking at new drug combinations before surgery. They are also looking at new ways of combining chemotherapy with targeted therapy, hormone therapy, or radiation therapy. In addition, they are studying lab tests that may predict whether a woman might be helped by chemotherapy.
- **Hormone therapy:** Doctors are testing several types of hormone therapy, including aromatase inhibitors. They are looking at whether hormone therapy before surgery may help shrink the tumor.
- **Supportive care:** Doctors are looking at ways to lessen the side effects of treatment, such as lymphedema after surgery. They are looking at ways to reduce pain and improve quality of life.

If you're interested in being part of a clinical trial, talk with your doctor. You may want to read the NCI booklet *Taking Part in Cancer Treatment Research Studies*. It describes how treatment studies are carried out and explains their possible benefits and risks.

The NCI Web site includes a section on clinical trials at <http://www.cancer.gov/clinicaltrials>. It has general information about clinical trials as well as detailed information about specific ongoing studies of breast cancer. Information specialists at **1-800-4-CANCER (1-800-422-6237)** or at **LiveHelp** at <http://www.cancer.gov/help> can answer questions and provide information about clinical trials.

Dictionary

Definitions of thousands of terms are on the NCI Web site in the NCI Dictionary of Cancer Terms. You can access it at <http://www.cancer.gov/dictionary>.

Adjuvant therapy (A-joo-vant THAYR-uh-pee): Treatment given after the primary treatment to increase the chances of a cure. Adjuvant therapy may include chemotherapy, radiation therapy, hormone therapy, targeted therapy, or biological therapy.

Anastrozole (an-AS-troh-zohl): An anticancer drug that is used to decrease estrogen production and suppress the growth of tumors that need estrogen to grow. It belongs to the family of drugs called aromatase inhibitors.

Anesthesia (A-nes-THÉE-zhuh): A loss of feeling or awareness caused by drugs or other substances. Anesthesia keeps patients from feeling pain during surgery or other procedures.

Areola (a-REE-o-la): The area of dark-colored skin on the breast that surrounds the nipple.

Aromatase inhibitor (uh-ROH-muh-tayz in-HIH-bih-ter): A drug that prevents the formation of estradiol, a female hormone, by interfering with an aromatase enzyme. Aromatase inhibitors are used as a type of hormone therapy for postmenopausal women who have hormone-dependent breast cancer.

Atypical hyperplasia (AY-TIP-ih-kul HY-per-PLAY-zhuh): A benign (not cancer) condition in which cells look abnormal under a microscope and are increased in number.

Axilla (ak-SIL-a): The underarm or armpit.

Axillary lymph node (AK-sih-LAYR-ee limf): A lymph node in the armpit region that drains lymph from the breast and nearby areas.

Benign (beh-NINE): Not cancer. Benign tumors may grow larger but do not spread to other parts of the body.

Biopsy (BY-op-see): The removal of cells or tissues for examination by a pathologist. The pathologist may study the tissue under a microscope or perform other tests on the cells or tissue. There are many different types of biopsy procedures. The most common types include: (1) incisional biopsy, in which only a sample of tissue is removed; (2) excisional biopsy, in which an entire lump or suspicious area is removed; and (3) needle biopsy, in which a sample of tissue or fluid is removed with a needle. When a wide needle is used, the procedure is called a core biopsy. When a thin needle is used, the procedure is called a fine-needle aspiration biopsy.

Bone scan: A technique to create images of bones on a computer screen or on film. A small amount of radioactive material is injected into a blood vessel and travels through the bloodstream; it collects in the bones and is detected by a scanner.

Brachytherapy (BRAY-kee-THAYR-uh-pee): A type of radiation therapy in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called implant radiation therapy, internal radiation therapy, and radiation brachytherapy.

BRCA1: A gene on chromosome 17 that normally helps to suppress cell growth. A person who inherits certain mutations (changes) in a BRCA1 gene has a higher risk of getting breast, ovarian, prostate, and other types of cancer.

BRCA2: A gene on chromosome 13 that normally helps to suppress cell growth. A person who inherits certain mutations (changes) in a BRCA2 gene has a higher risk of getting breast, ovarian, prostate, and other types of cancer.

Breast-conserving surgery (SER-juh-ree): An operation to remove the breast cancer but not the breast itself. Types of breast-conserving surgery include lumpectomy (removal of the lump), quadrantectomy (removal of one quarter, or quadrant, of the breast), and segmental mastectomy (removal of the cancer as well as some of the breast tissue around the tumor and the lining over the chest muscles below the tumor). Also called breast-sparing surgery.

Breast-sparing surgery (SER-juh-ree): An operation to remove the breast cancer but not the breast itself. Types of breast-sparing surgery include lumpectomy (removal of the lump), quadrantectomy (removal of one quarter, or quadrant, of the breast), and segmental mastectomy (removal of the cancer as well as some of the breast tissue around the tumor and the lining over the chest muscles below the tumor). Also called breast-conserving surgery.

Calcium (KAL-see-um): A mineral needed for healthy teeth, bones, and other body tissues. A deposit of calcium in body tissues, such as breast tissue, may be a sign of disease.

Cancer (KAN-ser): A term for diseases in which abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems.

Carcinoma (KAR-sih-NOH-muh): Cancer that begins in the skin or in tissues that line or cover internal organs.

Cell: The individual unit that makes up the tissues of the body. All living things are made up of one or more cells.

Chemotherapy (KEE-moh-THAYR-uh-pee): Treatment with drugs that kill cancer cells.

Chromosome (KROH-muh-some): Part of a cell that contains genetic information. Except for sperm and eggs, all human cells contain 46 chromosomes.

Clinical breast exam: A physical exam of the breast performed by a health care provider to check for lumps or other changes. Also called CBE.

Clinical trial: A type of research study that tests how well new medical approaches work in people. These studies test new methods of screening, prevention, diagnosis, or treatment of a disease. Also called clinical study.

Contrast material: A dye or other substance that helps show abnormal areas inside the body. It is given by injection into a vein, by enema, or by mouth. Contrast material may be used with x-rays, CT scans, MRI, or other imaging tests.

Core biopsy (BY-op-see): The removal of a tissue sample with a wide needle for examination under a microscope. Also called core needle biopsy.

CT scan: A series of detailed pictures of areas inside the body taken from different angles. The pictures are created by a computer linked to an x-ray machine. Also called CAT scan, computed tomography scan, computerized axial tomography scan, and computerized tomography.

Cyst (sist): A sac or capsule in the body. It may be filled with fluid or other material.

DES: A synthetic form of the hormone estrogen that was prescribed to pregnant women between about 1940 and 1971 because it was thought to prevent miscarriages. DES may increase the risk of uterine, ovarian, or breast cancer in women who took it. It also has been linked to an increased risk of clear cell carcinoma of the vagina or cervix in daughters exposed to DES before birth. Also called diethylstilbestrol.

Diagnostic mammogram (MAM-o-gram): X -ray of the breasts used to check for breast cancer after a lump or other sign or symptom of breast cancer has been found.

Digestive tract (dy-JES-tiv): The organs through which food and liquids pass when they are swallowed, digested, and eliminated. These organs are the mouth, esophagus, stomach, small and large intestines, and rectum and anus.

Duct (dukt): In medicine, a tube or vessel of the body through which fluids pass.

Ductal carcinoma in situ (DUK-tal KAR-sih-NOH-muh in SYE-too): A noninvasive condition in which abnormal cells are found in the lining of a breast duct. The abnormal cells have not spread outside the duct to other tissues in the breast. In some cases, ductal carcinoma in situ may become invasive cancer and spread to other tissues, although it is not known at this time how to predict which lesions will become invasive. Also called DCIS and intraductal carcinoma.

Estradiol (es-truh-DY-ol): A form of the hormone estrogen.

Estrogen (ES-truh-jin): A type of hormone made by the body that helps develop and maintain female sex characteristics and the growth of long bones. Estrogens can also be made in the laboratory. They may be used as a type of birth control and to treat symptoms of menopause, menstrual disorders, osteoporosis, and other conditions.

Excisional biopsy (ek-SIH-zhun-al BY-op-see): A surgical procedure in which an entire lump or suspicious area is removed for diagnosis. The tissue is then examined under a microscope.

Exemestane (EK-seh-MEH-stayn): A drug used to treat advanced breast cancer and to prevent recurrent breast cancer in postmenopausal women who have

already been treated with tamoxifen. It is also being studied in the treatment of other types of cancer. Exemestane causes a decrease in the amount of estrogen made by the body. It is a type of aromatase inhibitor. Also called Aromasin.

External radiation therapy (RAY-dee-AY-shun THAYR-uh-pee): A type of radiation therapy that uses a machine to aim high-energy rays at the cancer from outside of the body. Also called external-beam radiation therapy.

Fibrous: Containing or resembling fibers.

Fine-needle aspiration biopsy (as-per-AY-shun BY-op-see): The removal of tissue or fluid with a thin needle for examination under a microscope. Also called FNA biopsy.

Gene: The functional and physical unit of heredity passed from parent to offspring. Genes are pieces of DNA, and most genes contain the information for making a specific protein.

Genome (JEE-nome): The complete genetic material of an organism.

Gland: An organ that makes one or more substances, such as hormones, digestive juices, sweat, tears, saliva, or milk.

Goserelin (go-SAIR-uh-lin): A drug that belongs to the family of drugs called gonadotropin-releasing hormone analogs. Goserelin is used to block hormone production in the ovaries or testicles.

HER2/neu: A protein involved in normal cell growth. It is found on some types of cancer cells, including breast and ovarian. Cancer cells removed from the body may be tested for the presence of HER2/neu to help decide the best type of treatment. Also called c-erbB-2, human EGF receptor 2, and human epidermal growth factor receptor 2.

Hodgkin lymphoma (HOJ-kin lim-FOH-muh): A cancer of the immune system that is marked by the presence of a type of cell called the Reed-Sternberg cell. Also called Hodgkin disease.

Hormone receptor test (HOR-mone reh-SEP-ter): A test to measure the amount of certain proteins, called hormone receptors, in cancer tissue. Hormones can attach to these proteins. A high level of hormone receptors may mean that hormones help the cancer grow.

Hormone therapy (HOR-mone THAYR-uh-pee): Treatment that adds, blocks, or removes hormones. For certain conditions (such as diabetes or menopause), hormones are given to adjust low hormone levels. To slow or stop the growth of certain cancers (such as prostate and breast cancer), synthetic hormones or other drugs may be given to block the body's natural hormones. Sometimes surgery is needed to remove the gland that makes a certain hormone. Also called endocrine therapy, hormonal therapy, and hormone treatment.

Implant radiation therapy (RAY-dee-AY-shun THAYR-uh-pee): A type of radiation therapy in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called brachytherapy, internal radiation therapy, and radiation brachytherapy.

Incisional biopsy (in-SIH-zhun-al BY-op-see): A surgical procedure in which a portion of a lump or suspicious area is removed for diagnosis. The tissue is then examined under a microscope to check for signs of disease.

Inflammatory breast cancer (in-FLA-muh-TOR-ee): A type of breast cancer in which the breast looks red and swollen and feels warm. The skin of the breast may also show the pitted appearance called peau

d'orange (like the skin of an orange). The redness and warmth occur because the cancer cells block the lymph vessels in the skin.

Internal radiation therapy (in-TER-nul RAY-dee-AY-shun THAYR-uh-pee): A type of radiation therapy in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called brachytherapy, implant radiation therapy, and radiation brachytherapy.

Intravenous (IN-truh-VEE-nus): Into or within a vein. Intravenous usually refers to a way of giving a drug or other substance through a needle or tube inserted into a vein. Also called IV.

Invasive breast cancer (in-VAY-siv KAN-ser): Cancer that has spread from where it started in the breast into surrounding, healthy tissue. Most invasive breast cancers start in the ducts (tubes that carry milk from the lobules to the nipple). Invasive breast cancer can spread to other parts of the body through the blood and lymph systems. Also called infiltrating breast cancer.

Lapatinib (luh-PA-tih-nib): A drug used with another anticancer drug to treat breast cancer that is HER2 positive and has advanced or metastasized (spread to other parts of the body) after treatment with other drugs. Lapatinib is also being studied in the treatment of other types of cancer. Also called TYKERB®.

Letrozole (LET-ruh-zole): A drug used to treat advanced breast cancer in postmenopausal women. Letrozole causes a decrease in the amount of estrogen made by the body. It is a type of aromatase inhibitor. Also called Femara.

Leukemia (loo-KEE-mee-uh): Cancer that starts in blood-forming tissue such as the bone marrow and causes large numbers of blood cells to be produced and enter the bloodstream.

Leuprolide (LOO-pro-lide): A drug that blocks the body from making testosterone (a male hormone) and estradiol (a female hormone). It may stop the growth of cancer cells that need the hormone to grow. It is a type of gonadotropin-releasing hormone analog.

LH-RH agonist: A drug that inhibits the secretion of sex hormones. In men, LH-RH agonist causes testosterone levels to fall. In women, LH-RH agonist causes the levels of estrogen and other sex hormones to fall. Also called luteinizing hormone-releasing hormone agonist.

Lobe: A portion of an organ, such as the liver, lung, breast, thyroid, or brain.

Lobular carcinoma in situ (LAH-byuh-ler KAR-sih-NOH-muh in SY-too): A condition in which abnormal cells are found in the lobules of the breast. Lobular carcinoma in situ seldom becomes invasive cancer; however, having it in one breast increases the risk of developing breast cancer in either breast. Also called LCIS.

Lobule (LOB-yule): A small lobe or a subdivision of a lobe.

Local therapy (THAYR-uh-pee): Treatment that affects cells in the tumor and the area close to it.

Locally advanced cancer: Cancer that has spread from where it started to nearby tissue or lymph nodes.

Lumpectomy (lum-PEK-toh-mee): Surgery to remove abnormal tissue or cancer from the breast and a small amount of normal tissue around it. It is a type of breast-sparing surgery.

Lymph node (limf): A rounded mass of lymphatic tissue that is surrounded by a capsule of connective tissue. Lymph nodes filter lymph (lymphatic fluid), and they store lymphocytes (white blood cells). They are located along lymphatic vessels. Also called lymph gland.

Lymph vessel (limf): A thin tube that carries lymph (lymphatic fluid) and white blood cells through the lymphatic system. Also called lymphatic vessel.

Lymphedema (LIM-fuh-DEE-muh): A condition in which excess fluid collects in tissue and causes swelling. It may occur in the arm or leg after lymph vessels or lymph nodes in the underarm or groin are removed or treated with radiation.

Malignant (muh-LIG-nunt): Cancerous. Malignant tumors can invade and destroy nearby tissue and spread to other parts of the body.

Mammogram (MAM-o-gram): An x-ray of the breast.

Mastectomy (ma-STEK-toh-mee): Surgery to remove the breast (or as much of the breast tissue as possible).

Medical oncologist (MEH-dih-kul on-KAH-loh-jist): A doctor who specializes in diagnosing and treating cancer using chemotherapy, targeted therapy, hormonal therapy, and biological therapy. A medical oncologist often is the main health care provider for someone who has cancer. A medical oncologist also gives supportive care and may coordinate treatment given by other specialists.

Menopausal hormone therapy (MEH-nuh-PAW-zul HOR-mone THAYR-uh-pee): Hormones (estrogen, progesterone, or both) given to women after menopause to replace the hormones no longer produced by the ovaries. Also called hormone replacement therapy and HRT.

Menopause (MEH-nuh-PAWZ): The time of life when a woman's ovaries stop working and menstrual periods stop. Natural menopause usually occurs around age 50. A woman is said to be in menopause when she hasn't had a period for 12 months in a row. Symptoms of menopause include hot flashes, mood swings, night sweats, vaginal dryness, trouble concentrating, and infertility.

Menstrual period (MEN-stroo-al): The periodic discharge of blood and tissue from the uterus. From puberty until menopause, menstruation occurs about every 28 days, but does not occur during pregnancy.

Metastasis (meh-TAS-tuh-sis): The spread of cancer from one part of the body to another. A tumor formed by cells that have spread is called a “metastatic tumor” or a “metastasis.” The metastatic tumor contains cells that are like those in the original (primary) tumor. The plural form of metastasis is metastases (meh-TAS-tuh-SEEZ).

Metastatic (meh-tuh-STA-tik): Having to do with metastasis, which is the spread of cancer from one part of the body to another.

Microcalcification (MY-kroh-KAL-sih-fih-KAY-shun): A tiny deposit of calcium in the breast that cannot be felt but can be detected on a mammogram. A cluster of these very small specks of calcium may indicate that cancer is present.

Modified radical mastectomy (RA-dih-kul ma-STEK-toh-mee): Surgery for breast cancer in which the breast, most or all of the lymph nodes under the arm, and the lining over the chest muscles are removed. Sometimes the surgeon also removes part of the chest wall muscles.

MRI: A procedure in which radio waves and a powerful magnet linked to a computer are used to create detailed pictures of areas inside the body. These pictures can show the difference between normal and diseased tissue. MRI makes better images of organs and soft tissue than other scanning techniques, such as computed tomography (CT) or x-ray. MRI is especially useful for imaging the brain, the spine, the soft tissue of joints, and the inside of bones. Also called magnetic resonance imaging, NMRI, and nuclear magnetic resonance imaging.

Neoadjuvant therapy (NEE-oh-A-joo-vant THAYR-uh-pee): Treatment given as a first step to shrink a tumor before the main treatment, which is usually surgery, is given. Examples of neoadjuvant therapy include chemotherapy, radiation therapy, and hormone therapy. It is a type of induction therapy.

Oncology nurse (on-KAH-loh-jee): A nurse who specializes in treating and caring for people who have cancer.

Ovarian cancer (oh-VAYR-ee-un KAN-ser): Cancer that forms in tissues of the ovary (one of a pair of female reproductive glands in which the ova, or eggs, are formed).

Ovary (OH-vuh-ree): One of a pair of female reproductive glands in which the ova, or eggs, are formed. The ovaries are located in the pelvis, one on each side of the uterus.

Partial mastectomy (ma-STEK-toh-mee): The removal of cancer as well as some of the breast tissue around the tumor and the lining over the chest muscles below the tumor. Usually some of the lymph nodes under the arm are also taken out. Also called segmental mastectomy.

Pathologist (puh-THAH-loh-jist): A doctor who identifies diseases by studying cells and tissues under a microscope.

Physical therapist: A health professional who teaches exercises and physical activities that help condition muscles and restore strength and movement.

Plastic surgeon (SER-jun): A surgeon who specializes in reducing scarring or disfigurement that may occur as a result of accidents, birth defects, or treatment for diseases.

Plastic surgery (SER-juh-ree): An operation that restores or improves the appearance of body structures.

Precancerous (pre-KAN-ser-us): A term used to describe a condition that may (or is likely to) become cancer. Also called premalignant.

Progesterone (proh-JES-tuh-RONE): A type of hormone made by the body that plays a role in the menstrual cycle and pregnancy. Progesterone can also be made in the laboratory. It may be used as a type of birth control and to treat menstrual disorders, infertility, symptoms of menopause, and other conditions.

Prosthesis (pros-THEE-sis): A device, such as an artificial leg, that replaces a part of the body.

Radiation oncologist (RAY-dee-AY-shun on-KAH-loh-jist): A doctor who specializes in using radiation to treat cancer.

Radiation therapy (RAY-dee-AY-shun THAYR-uh-pee): The use of high-energy radiation from x-rays, gamma rays, neutrons, protons, and other sources to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy), or it may come from radioactive material placed in the body near cancer cells (internal radiation therapy). Systemic radiation therapy uses a radioactive substance, such as a radiolabeled monoclonal antibody, that travels in the blood to tissues throughout the body. Also called irradiation and radiotherapy.

Radioactive (RAY-dee-oh-AK-tiv): Giving off radiation.

Reconstructive surgeon (REE-kun-STRUK-tiv SER-jun): A doctor who can surgically reshape or rebuild (reconstruct) a part of the body, such as a woman's breast after surgery for breast cancer.

Recurrent cancer (ree-KER-ent KAN-ser): Cancer that has recurred (come back), usually after a period of time during which the cancer could not be detected.

The cancer may come back to the same place as the original (primary) tumor or to another place in the body. Also called recurrence.

Registered dietitian (dy-eh-TIH-shun): A health professional with special training in the use of diet and nutrition to keep the body healthy. A registered dietitian may help the medical team improve the nutritional health of a patient.

Risk factor: Something that may increase the chance of developing a disease. Some examples of risk factors for cancer include age, a family history of certain cancers, use of tobacco products, certain eating habits, obesity, lack of exercise, exposure to radiation or other cancer-causing agents, and certain genetic changes.

Screening mammogram (MAM-o-gram): X-rays of the breasts taken to check for breast cancer in the absence of signs or symptoms.

Segmental mastectomy (seg-MEN-tul ma-STEK-toh-mee): The removal of cancer as well as some of the breast tissue around the tumor and the lining over the chest muscles below the tumor. Usually some of the lymph nodes under the arm are also taken out. Also called partial mastectomy.

Sentinel lymph node biopsy: Removal and examination of the sentinel node(s) (the first lymph node[s] to which cancer cells are likely to spread from a primary tumor). To identify the sentinel lymph node(s), the surgeon injects a radioactive substance, blue dye, or both near the tumor. The surgeon then uses a scanner to find the sentinel lymph node(s) containing the radioactive substance or looks for the lymph node(s) stained with dye. The surgeon then removes the sentinel node(s) to check for the presence of cancer cells.

Side effect: A problem that occurs when treatment affects healthy tissues or organs. Some common side effects of cancer treatment are fatigue, pain, nausea, vomiting, decreased blood cell counts, hair loss, and mouth sores.

Supportive care: Care given to improve the quality of life of patients who have a serious or life-threatening disease. The goal of supportive care is to prevent or treat as early as possible the symptoms of a disease, side effects caused by treatment of a disease, and psychological, social, and spiritual problems related to a disease or its treatment. Also called comfort care, palliative care, and symptom management.

Surgeon (SER-jun): A doctor who removes or repairs a part of the body by operating on the patient.

Surgery (SER-juh-ree): A procedure to remove or repair a part of the body or to find out whether disease is present. An operation.

Surgical biopsy (SER-jih-kul BY-op-see): The removal of tissue by a surgeon for examination by a pathologist. The pathologist may study the tissue under a microscope.

Systemic therapy (sis-TEH-mik THAYR-uh-pee): Treatment using substances that travel through the bloodstream, reaching and affecting cells all over the body.

Tamoxifen (tuh-MOK-sih-FEN): A drug used to treat certain types of breast cancer in women and men. It is also used to prevent breast cancer in women who have had ductal carcinoma in situ (abnormal cells in the ducts of the breast) and in women who are at a high risk of developing breast cancer. It blocks the effects of the hormone estrogen in the breast.

Targeted therapy (TAR-geh-ted THAYR-uh-pee): A type of treatment that uses drugs or other substances, such as monoclonal antibodies, to identify and attack specific cancer cells. Targeted therapy may have fewer side effects than other types of cancer treatments.

Tissue (TISH-oo): A group or layer of cells that work together to perform a specific function.

Total mastectomy (ma-STEK-toh-mee): Removal of the breast. Also called simple mastectomy.

Trastuzumab (tras-TOO-zuh-mab): A monoclonal antibody that binds to HER2 (human epidermal growth factor receptor 2), and can kill HER2-positive cancer cells. Monoclonal antibodies are made in the laboratory and can locate and bind to substances in the body, including cancer cells. Trastuzumab is used to treat breast cancer that is HER2-positive and has spread after treatment with other drugs. It is also used with other anticancer drugs to treat HER2-positive breast cancer after surgery. Also called Herceptin®.

Tumor (TOO-mer): An abnormal mass of tissue that results when cells divide more than they should or do not die when they should. Tumors may be benign (not cancer), or malignant (cancer). Also called neoplasm.

Ultrasound (UL-truh-SOWND): A procedure in which high-energy sound waves are bounced off internal tissues or organs and make echoes. The echo patterns are shown on the screen of an ultrasound machine, forming a picture of body tissues called a sonogram. Also called ultrasonography.

X-ray: A type of high-energy radiation. In low doses, x-rays are used to diagnose diseases by making pictures of the inside of the body. In high doses, x-rays are used to treat cancer.

National Cancer Institute Publications

NCI provides publications about cancer, including the booklets and fact sheets mentioned in this booklet. Many are available in both English and Spanish.

You may order these publications by telephone, on the Internet, or by mail. You may also read them online and print your own copy.

- **By telephone:** People in the United States and its territories may order these and other NCI publications by calling the NCI Cancer Information Service at **1-800-4-CANCER (1-800-422-6237)**.
- **On the Internet:** Many NCI publications may be viewed, downloaded, and ordered from **<http://www.cancer.gov/publications>** on the Internet. People in the United States and its territories may use this Web site to order printed copies. This Web site also explains how people outside the United States can mail or fax their requests for NCI booklets.
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- *Follow-up Care After Cancer Treatment*
- *Facing Forward: Ways You Can Make a Difference in Cancer*

Advanced or Recurrent Cancer

- *Coping With Advanced Cancer*
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Complementary Medicine

- *Thinking about Complementary & Alternative Medicine: A guide for people with cancer*
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- *When Someone You Love Is Being Treated for Cancer: Support for Caregivers*
- *When Someone You Love Has Advanced Cancer: Support for Caregivers*
- *Facing Forward: When Someone You Love Has Completed Cancer Treatment*
- *Caring for the Caregiver: Support for Cancer Caregivers*

Finding Breast Changes

- *Understanding Breast Changes*
- *Mammograms* (also in Spanish)

The National Cancer Institute

The National Cancer Institute (NCI), part of the National Institutes of Health, is the Federal Government's principal agency for cancer research and training. NCI conducts and supports basic and clinical research to find better ways to prevent, diagnose, and treat cancer. The Institute also supports education and training for cancer research and treatment programs. In addition, NCI is responsible for communicating its research findings to the medical community and the public.

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