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NCCN Guidelines for Patients®

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# Stage 0 Breast Cancer



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# Stage 0 Breast Cancer

Breast cancer is the most common type of cancer in women. Learning that you are at risk for or have breast cancer can feel overwhelming. The goal of this book is to help you get the best care. It presents which cancer tests and treatments are recommended for carcinoma in situ by experts in breast cancer.

The National Comprehensive Cancer Network® (NCCN®) is a not-for-profit alliance of 25 of the world's leading cancer centers. Experts from NCCN have written treatment guidelines for doctors who treat stage 0 breast cancer. These treatment guidelines suggest what the best practice is for cancer care. The information in this patient book is based on the guidelines written for doctors.

This book focuses on the treatment of Stage 0 breast cancer. NCCN also offers patient books on colon cancer, lung cancer, melanoma, and many other cancer types. Visit [NCCN.org/patients](http://NCCN.org/patients) for the full library of patient books as well as other patient and caregiver resources.

NCCN® aims to improve the care given to patients with cancer. NCCN staff work with experts to create helpful programs and resources for many stakeholders. Stakeholders include health providers, patients, businesses, and others. One resource is the series of books for patients called the NCCN Patient Guidelines®. Each book presents the best practice for a type of cancer.

The patient books are based on clinical practice guidelines written for cancer doctors. These guidelines are called the NCCN Guidelines®. Clinical practice guidelines list the best health care options for groups of patients. Many doctors use them to help plan cancer treatment for their patients.

Panelists of experts create the NCCN Guidelines. Most of the experts are from the 25 NCCN Member Institutions. Panelists may include surgeons, radiation oncologists, medical oncologists, and patient advocates. Recommendations in the NCCN Guidelines are based on clinical trials and the experience of the panelists.

The NCCN Guidelines are updated at least once a year. When funded, the patient books are updated to reflect the most recent version of the NCCN Guidelines for doctors. For more information about the NCCN Guidelines, visit [NCCN.org/clinical.asp](http://NCCN.org/clinical.asp).

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#### **Supported by the NCCN Foundation®**

The NCCN Foundation supports the mission of the National Comprehensive Cancer Network® (NCCN®) to improve the care of patients with cancer. One of its aims is to raise funds to create a library of books for patients. Learn more about the NCCN Foundation at [NCCN.org/foundation](http://NCCN.org/foundation).

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# Stage 0 Breast Cancer

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### Who should read this book?

This book is about care of women with stage 0 breast cancer. Patients and those who support them—caregivers, family, and friends—may find this book helpful. It may help you talk with your treatment team, understand what doctors say, and prepare for treatment.

### Does the whole book apply to me?

This book includes information for many situations. Thus, not everyone will get every test and treatment listed. Your treatment team can point out what applies to you and give you more information. As you read through this book, you may find it helpful to make a list of questions to ask your doctors.

The recommendations in this book are based on science and the experience of NCCN experts. However, these recommendations may not be right for you. Your doctors may suggest other tests or treatments based on your health and other factors. If other tests or treatments are suggested, feel free to ask your treatment team questions.

### Making sense of medical terms

In this book, many medical words are included that describe cancer, tests, and treatments. These are words that you will likely hear from your treatment team. Most of the information may be new to you, and it may be a lot to learn. Don't be discouraged as you read. Keep reading and review the information. Don't be shy to ask your treatment team to explain a word or phrase that you do not understand.

Words that you may not know are defined in the text or in the *Dictionary*. Words in the *Dictionary* are underlined when first used in a page.

Acronyms are also defined when first used and in the *Glossary*. Acronyms are words formed from the first letters of other words. One example is LCIS for lobular carcinoma **in situ**.

# Breast cancer basics



# 1 Breast cancer basics

6 Women's breasts

6 Carcinoma in situ

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## Women's breasts

Before puberty, breasts have a ring of darker skin called the areola. In the middle of the areola is the raised tip of the breast called the nipple. Under the nipple, small milk ducts branch into fatty tissue like early growth from a seedling. These immature ducts are supported by connective tissue called stroma.

Among girls, increases in female hormones during puberty cause their breasts to change. The stroma increases, the ducts grow and branch out like tree limbs, and lobules form at the end of the ducts like leaflets at the end of twigs. Lobules are small sacs that make breast milk after a baby is born. Breast milk drains from the millions of leaf-like lobules into the milk ducts that connect to the nipple. **See Figure 1** for a look inside women's breasts.

## Carcinoma in situ

Breast cancer is a disease of cells—the building blocks of tissue in the body. Almost all breast cancers are "carcinomas." Carcinomas are a family of cancers

that begin in cells that line the inner or outer surfaces of the body. Examples include surfaces of ducts and the gut and skin.

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**This book focuses on carcinoma in situ of the breast. "In situ" means that no abnormal cells have grown into the stroma. Carcinoma in situ is stage 0 breast cancer.**

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The two kinds of carcinoma in situ are:

- LCIS (lobular carcinoma in situ) – Although called a carcinoma, LCIS isn't cancer but abnormal cell growth within the lobules; and
- DCIS (ductal carcinoma in situ) – DCIS is cancer that started in ductal cells and hasn't grown outside the milk ducts.

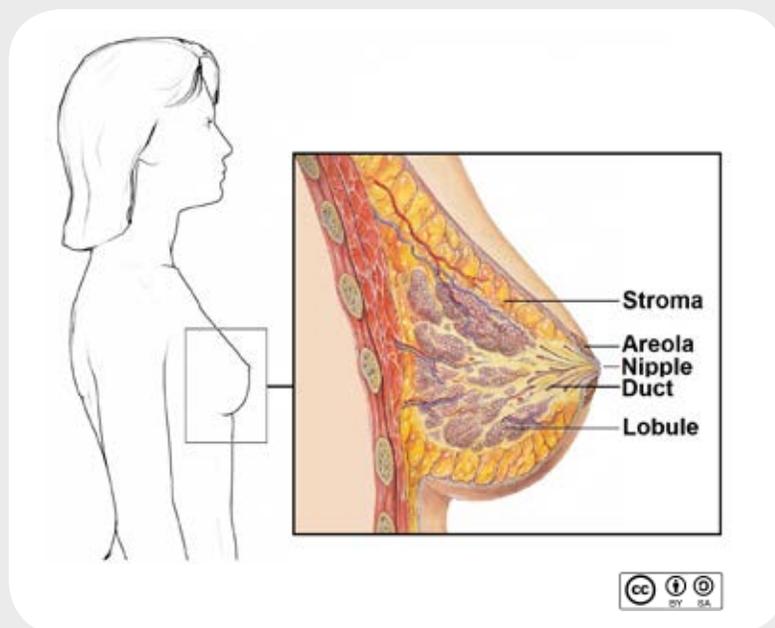
## Cancer growth

Cells have a control center called the nucleus. The nucleus contains special molecules called chromosomes. Within chromosomes are coded instructions, called genes, for building new cells and controlling how cells behave. Changes in genes, called mutations, cause normal breast cells to become cancer cells. But what causes genes in breast cells to change isn't fully known. Research has found some risk factors. A risk factor is anything that increases a woman's chances of getting breast cancer. One example of a risk factor is LCIS. Having had LCIS increases your chances for breast cancer.

Cancer cells don't behave like normal cells in three key ways. First, the changes in genes cause cancer cells to make too many copies of themselves. Normal cells divide and multiply when new cells are needed, but otherwise live in a resting state. Normal cells also die when old or damaged. In contrast, cancer cells make new cells that aren't needed and don't die quickly when old or damaged. Over time, cancer cells form a mass called the primary tumor.

The second way cancer cells differ from normal cells is that they can grow into surrounding tissues. If not treated, the primary tumor can extend beyond the walls of lobules or ducts into the stroma. Breast cancers that haven't grown into the stroma are called "noninvasive" and breast cancers that have grown into the stroma are called "invasive." DCIS is a noninvasive breast cancer.

**Figure 1. Parts of the breast**



Derivative work of Breast Anatomy by Patrick J. Lynch and C. Carl Jaffe, MD available at [commons.wikimedia.org/wiki/File:Breast\\_anatomy\\_normal\\_scheme.png](https://commons.wikimedia.org/wiki/File:Breast_anatomy_normal_scheme.png) under a Creative Commons Attribution 3.0 Unported license.

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Third, unlike normal cells, cancer cells can leave the breast and form tumors in other parts of the body. Breast cancer can spread to distant organs through blood or lymph vessels that are in the stroma. This is why it is important to find and treat breast cancer early when it is noninvasive.

Most often, breast cancer spreads through lymph. Lymph is a clear fluid that gives cells water and food. It also has white blood cells that fight germs. Lymph nodes filter lymph and remove the germs. Most of the lymph in the breast drains to the axillary lymph nodes found inside the armpit. **See Figure 2.** Once in the axillary nodes, cancer cells can multiply and form secondary tumors.

## Review

- Inside of women's breasts are lobules that can make milk, milk ducts, and fatty tissue called stroma.
- Breast cancer often starts in the milk ducts or lobules and then spreads into the stroma.
- LCIS is abnormal cell growth within lobules. DCIS is breast cancer that hasn't spread outside the milk ducts.
- Breast cancer can spread outside the breast through lymph or blood.

**Figure 2. Axillary lymph nodes**



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# Lobular carcinoma in situ



# 2 Lobular carcinoma in situ

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Part 2 describes the care for LCIS. LCIS isn't cancer but a group of abnormal cells.

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However, if you have had LCIS, you are more likely to get breast cancer than women without LCIS. Getting the right tests and treatments can help prevent breast cancer or find breast cancer early. In Part 2, you will find information on tests, diagnosis, risk reduction, and follow-up care.

## Tests

### Medical history

Your medical history includes any health events in your life and any medications you've taken. Your doctor will want to know about all your illnesses, breast biopsies, any radiation therapy especially within the chest, and if you are pregnant. It may help to make a list of old and new medications while at home to bring to your doctor's office. Since breast cancer and other health conditions can run in families, your doctor will ask about the medical history of your relatives.

### Physical exam

A physical exam is a review of your body for signs of disease. During this exam, your doctor will listen to your lungs, heart, and gut. He or she will also look at and touch your breasts and nearby lymph nodes to see if they feel normal. Your breasts may be felt while you sit or stand up as well as when you recline. This is called a CBE (clinical breast exam). Besides your breasts, other parts of your body will be felt to see if organs are of normal size, are soft or hard, or cause pain when touched.

## Diagnostic mammography

Mammography uses x-rays to make pictures of the insides of the breast. These pictures are called mammograms. Mammography that is used for breast cancer screening often takes two pictures of each breast. Diagnostic mammography takes more pictures from different angles. A bilateral mammogram means taking pictures of both breasts.

Mammography is recommended to look for abnormal areas in either breast. It is also recommended to find cancers early before they can be felt as a lump on self-exam or CBE. Sometimes a breast ultrasound may also be needed to decide if a breast biopsy should be performed. [See Getting a mammography](#) for more information.

## Getting a mammography

Figure 3. Mammography

Mammography is often easy to undergo. Don't use or wash off deodorants, perfumes, powders, or lotions on your breasts and armpits before the test. These products can make the pictures unclear. You will also need to remove your top and bra.

In the exam room, a technician will tell you how to place your body next to the machine. As shown in the figure your breast will be placed onto a flat metal surface, called a plate. A second plate will be lowered onto your breast to flatten it. This may be painful but is important to do to get the least fuzzy image of the breast tissues. Pictures will be taken from a camera that is attached to the two plates. Mammography of both breasts takes about 20 minutes to complete.

The pictures are either printed on film or saved on a computer. An expert in mammography, called a radiologist, will view the pictures. He or she will report the test findings to your doctor.



## Pathology review

If your mammogram is abnormal, it is very important for your doctor to make a correct diagnosis. This means finding out if you have diseased breast tissue, and if so, what type of breast disease you have.

Diagnosis often requires a biopsy of breast tissue. A pathologist then needs to look at the biopsy samples with a microscope. A pathologist is a doctor who's an expert in laboratory tests of tissues and cells. The pathologist will confirm if you have LCIS, DCIS, invasive breast cancer, or another condition. If you have another stage of breast cancer (I–IV), NCCN offers books for those stages.

## Diagnosis

There is more than one type of biopsy used to test for breast cancer. FNA (fine-needle aspiratin) and core needle biopsies use a needle to remove tissue samples. After the skin is numbed, the needle is inserted through the skin and into the breast. Core biopsies can also be done with a probe that is inserted into the breast with a needle. After the needle is removed, a vacuum is used to remove tissue through the probe. When mammography is used to guide the needle, it is called a stereotactic-guided biopsy. Ultrasound-guided biopsy uses ultrasound to guide the needle.

## Excisional biopsy

Besides needle biopsies, there are other types of biopsies that use minor surgery to remove breast tissue. An incisional biopsy is a surgery that removes a sample of tissue, whereas an excisional biopsy is surgery that removes the whole tumor. If a needle, probe, or incisional biopsy was used for your biopsy, it is recommended that you have an excisional biopsy to rule out DCIS or invasive cancer. If no advanced disease is present, no further treatment is required.

Before an excisional biopsy, you may be asked to stop eating so that your stomach is nearly empty for the procedure. You may also need to stop taking some medicines. Local or general anesthesia may be used.

During an excisional biopsy, the whole tumor with some normal-looking tissue around its edge is removed using a surgical knife. The normal-looking tissue at the edge of the removed tissue is called the surgical margin. [See Figure 4.](#)

If your surgeon can't feel a lump, a small wire will first be inserted into the area using mammography. Then your surgeon will remove the tissue at the end of the wire. This is called a wire localization biopsy. An excisional biopsy will leave a small scar and may cause some pain and swelling for a few days. Ask your treatment team for a complete list of rare and common side effects.

## Risk Reduction

Besides LCIS, there are many other risk factors for breast cancer. One very important risk factor is if any of your blood relatives have had breast or ovarian cancer, especially at a young age. Using your medical and family history, your doctor will tell you, in general, how likely you are to get breast cancer.

If your risk may be high, you should be referred to a genetic counselor. A genetic counselor is an expert in gene changes related to cancer. The counselor can better determine your risk for breast cancer.

The counselor may suggest testing for mutations in genes that are related to breast cancer and passed down in families. Such mutations can occur in *BRCA1* and *BRCA2* genes. Normal BRCA genes help to prevent tumor growth. Women with *BRCA1* and *BRCA2* gene mutations are more likely to have breast and ovarian cancer than other women.

Your doctor may recommend ways to lower your risk for breast cancer based on your risk, general health, and other factors. This is called risk reduction. Three methods are used, which are:

### Lifestyle changes

Changes in your lifestyle may reduce your chances of developing another breast tumor. Examples are eating more healthfully, exercising more, and achieving a healthy body weight. Your doctor can suggest lifestyle changes that are specific to you.

### Hormone therapy

The second risk reduction method is taking hormone therapy drugs. Female hormones help some breast cancers grow. Thus, taking drugs that lower the amount of female hormones in your body or drugs

that stop hormones from working may help. Not all women with LCIS should take hormone therapy. Your doctors can let you know if hormone therapy is right for you. The drug used may differ between women who get menstrual periods and those who don't.

Although hormone therapy lowers breast cancer risk, it can cause hot flashes, cataracts, leg cramps, blood clots, and other cancers depending on the drug. Ask your treatment team for a complete list of side effects. Your doctor may also know about research studies of hormone therapy or other drugs that you can join.

### Surgery

The third method of risk reduction is surgery. Surgery is mostly done among women at high risk for breast cancer. One surgical option is a bilateral mastectomy, which is the complete removal of both breasts. A total mastectomy removes all breast tissue but no lymph nodes or chest muscles. Following the mastectomy, or in some cases at the same time as the mastectomy, you may want to have breast reconstruction. See page 29 for more information.

**Figure 4. Excisional biopsy**

During an excisional biopsy, the whole tumor with some normal-looking tissue around its edge is removed using a surgical knife. The normal-looking tissue at the edge of the removed tissue is called the surgical margin.

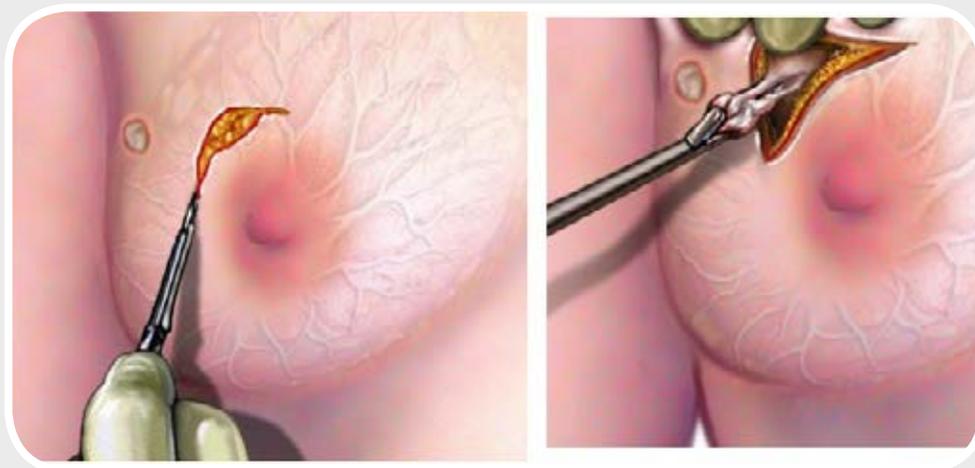


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Your doctor may suggest that you have a bilateral salpingo-oophorectomy. This surgery removes both ovaries and both fallopian tubes. It is only recommended if you likely have mutations in the *BRCA1* and *BRCA2* genes.

## Follow-up care

Follow-up care is important. It is done to assess your general health, find any breast tumors early, and check for side effects. Tell your doctor about any side effects from hormone therapy or other treatment you're taking. There may be ways to get relief.

Breast cancer in women who've had LCIS can start anywhere in the breast. It doesn't always start where the LCIS was found. Breast cancer may start in the ducts rather than the lobules. It can also start in the breast that didn't have LCIS. Although it's very rare, breast cancer can still occur if you've had a total mastectomy of both breasts. The tests used to screen for breast cancer are discussed next.

### Mammography

A bilateral mammography every year is recommended once a woman has reached a certain age. You should talk with your doctor about at what age you should start having mammograms, but certainly start by the age of 50. However, mammography isn't done if you've had both breasts removed for risk reduction. More information about mammography can be found on page 11.

### CBE

A CBE is recommended every 6 to 12 months. This test involves your doctor feeling your breasts to see whether there is a lump or thickening that isn't like normal breast tissue. If you had a total mastectomy of both breasts, your doctor will examine your chest or reconstructed breasts. These areas may be felt while you sit or stand up as well as when you recline. Your doctor will also check for enlarged lymph nodes in your armpits and around your collarbone. Some women feel uncomfortable having their breasts touched by their doctor. Keep in mind that this test provides important information and is quick.

### Breast awareness

Examining your own breasts is important. You should know the feel and look of your breasts so that you can tell if significant changes have occurred. If you get menstrual periods, a self exam at the end of your period may provide the best information.

When you find changes that persist for more than a month, you should see your doctor. He or she can decide if you need more tests. Changes in breasts are often not cancer. But if there's a problem, having any changes checked by your doctor will allow you to get treatment promptly.



### Breast MRI

Your doctor may want you to get a breast MRI (magnetic resonance imaging) if your family has a strong history of breast cancer. Breast MRI may also be done if you've had radiation therapy near your breasts. Breast MRI uses powerful magnets to make pictures of the insides of your breasts.

Before the test, a contrast dye may be injected into your vein to make the pictures clearer. The dye may cause you to feel flushed or get hives. Rarely, serious allergic reactions occur. Tell your doctor if you have had bad reactions before.

For a breast MRI, you must remove your top and bra and lie face down on a table. The table has padded openings for your breasts. In the openings, there are coils that help to make pictures. During breast MRI, the table moves slowly through the tunnel of the MRI machine. A breast MRI is completed in 30 to 45 minutes.



# Ductal carcinoma in situ



# 3 Ductal carcinoma in situ

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Part 3 describes the care for DCIS. DCIS is cancer that starts in the cells that line the milk ducts of the breasts. The cancer has not extended beyond the inside of the ducts.

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Getting the right tests and treatments can stop the cancer from spreading. In Part 3, you will find information on tests, genetic counseling, treatment, risk reduction, and follow-up care.

## Tests

### Medical history

Your medical history includes any health events in your life and any medications you've taken. Your doctor will want to know about all your illnesses, breast biopsies, any radiation therapy especially within the chest, and if you are pregnant. It may help to make a list of old and new medications while at home to bring to your doctor's office. Since breast cancer and other health conditions can run in families, your doctor will ask about the medical history of your relatives.

### Physical exam

A physical exam is a review of your body for signs of disease. During this exam, your doctor will listen to your lungs, heart, and gut. He or she will also look at and touch your breasts and nearby lymph nodes to see if they feel normal. Your breasts may be felt while you sit or stand up as well as when you recline. This is called a CBE (clinical breast exam). Besides your breasts, other parts of your body will be felt to see if organs are of normal size, are soft or hard, or cause pain when touched.

### Diagnostic mammography

Mammography uses x-rays to make pictures of the insides of the breast. These pictures are called mammograms. Mammography that is used for breast cancer screening often takes two pictures of each breast. Diagnostic mammography takes more pictures from different angles. A bilateral mammogram means taking pictures of both breasts.

Mammography is recommended to look for abnormal areas in either breast. It is also recommended to find cancers early before they can be felt as a lump on self-exam or CBE. Sometimes a breast ultrasound may also be needed to decide if a breast biopsy should be performed. See [Getting a mammography](#) on page 11 for more information.

### Pathology review

If your mammogram is abnormal, it is very important for your doctor to make a correct diagnosis. This means finding out if you have diseased breast tissues, and, if so, what type of breast disease you have. To determine if you have breast cancer, a sample of breast tissue needs to be removed from your body and tested for cancer cells. This is called a biopsy.

The tissue sample will be looked at by a pathologist. A pathologist is a doctor who's an expert in lab tests of tissues and cells. The pathologist will find out if you have DCIS, invasive breast cancer, or another condition. If cancer is found, the pathologist will do other tests on the tissue to learn more about the cancer. If you have another stage of breast cancer (I–IV), NCCN offers books for those stages.

All lab results are included in a pathology report that gets sent to your doctors. Some women get more than one pathology report. The first report may include the test results of a breast biopsy. Other pathology reports may include test results of breast tissue removed during surgical treatment.

It's a good idea to ask for a copy of your pathology reports. Also ask your treatment team any questions about the test results. These reports are used to plan treatment.

### Hormone receptor test

Estrogen and progesterone are female hormones that increase during puberty in girls causing their breasts to grow. For some breast cancers, the cancer cells have receptors to which these hormones attach causing the cells to grow and divide. However, the growth of cancer cells that have hormone receptors is usually slower than cancer cells without these receptors.

Testing for hormone receptors is important because there are drugs that can be used to stop hormones from causing cancer growth. IHC (immunohistochemistry) is the lab test used to see if cancer cells have hormone receptors. For this test, the cancer cells removed during the biopsy will be stained. The stain shows how many cells have hormone receptors and the number of hormone receptors in the cells. If at least 1 out of every 100 cancer cells stain positive, the cancer is called hormone receptor–positive DCIS. If fewer cancer cells stain positive for hormone receptors, the cancer is called hormone receptor–negative DCIS.

## Genetic counseling

About 10 out of 100 breast cancers are due to changes in genes that are passed down from a parent to a child. This is called hereditary breast cancer. Using your medical and family history, your doctor will assess how likely you are to have hereditary breast cancer. If your likelihood is high, he or she will refer you to a genetic counselor.

A genetic counselor is an expert in changes within genes that are related to disease. The counselor can tell you more about how likely you are to have hereditary breast cancer. He or she may suggest that you undergo genetic testing to look for changes in genes that increase your chances of developing breast cancer.

Hereditary breast cancer is most often caused by mutations in the *BRCA1* and *BRCA2* genes. Normal *BRCA* genes help to prevent tumor growth by fixing damaged cells and helping cells grow normally. Genetic testing can tell if you have a *BRCA* or another mutation. Your test results may be used to guide treatment planning.

Some abnormal changes in genes, called VUS (variants of unknown significance), are not fully understood by doctors. Your doctors may know of research that aims to learn more. If interested, ask your doctors about taking part in such research.

## Treatment

The cancer treatment that you will receive will partly depend on your biopsy. You may have had a biopsy that only removed some of the cancer. Such biopsies include a FNA, a core needle biopsy, and a surgical biopsy. After these biopsies, surgery to remove all of the DCIS is needed.

An excisional biopsy is a minor surgery that removes tissue for cancer testing. The goal of an excisional biopsy isn't to treat cancer, but instead is to determine if cancer is or is not present. A second surgery is likely needed after this biopsy to remove all the cancer with cancer-free surgical margins.

There are two types of surgery (re-excisions) that are recommended for DCIS treatment. Lumpectomy is a breast surgery that removes any area with cancer along with a surgical margin. It's like an excisional biopsy but removes more tissue. The other surgery used to treat DCIS is a mastectomy. Depending on the type, a mastectomy removes either a large part of or the whole breast.

Before either surgery, you will be asked to stop eating, drinking, and taking some medicines for a short period of time. If you smoke, it is important to stop. The three recommended treatments for DCIS that include these surgeries are described next.

### Lumpectomy only

Only a small group of women with DCIS are able to have a lumpectomy without any other cancer treatment. These women are very unlikely to have the breast cancer return after surgery because the extent of DCIS is so small. Your doctor will review your information to assess if you are at low risk. Breast cancer is less likely to return if the surgical margins are large and cancer-free, the tumor is small, and you are older than 50 years of age. Your doctor will talk with you about these and other factors so that the two of you can decide together if a lumpectomy alone is the best treatment.

For a lumpectomy, local or general anesthesia is used. Often, a surgeon will make a C-shaped cut into

the breast through which the tissue is removed. **See Figure 5.** This cut allows the breast to heal faster. A lumpectomy is finished within 15 to 40 minutes. Afterward, a tube may be placed in your breast to drain fluid. A lumpectomy will leave a small scar and may cause some pain and swelling for about a week. Ask your treatment team for a complete list of side effects.

The tissue from the lumpectomy will be tested by a pathologist for cancer cells at or near the margin. You also may be given another mammography to look for any cancer that wasn't removed. If it appears that cancer remains in your breast, more surgery is needed. The second surgery is often another lumpectomy but sometimes a mastectomy is needed.

**Figure 5. Lumpectomy**

For a lumpectomy, local or general anesthesia is used. Often, a surgeon will make a C-shaped cut into the breast through which the tissue is removed. This cut allows the tissue to heal faster. A lumpectomy is finished within 15 to 40 minutes.

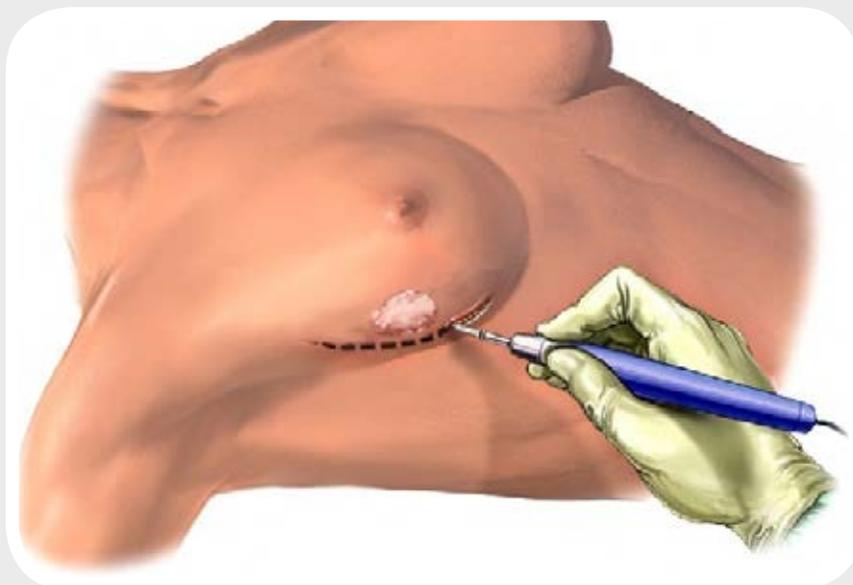


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### Lumpectomy and radiation therapy

A lumpectomy followed by radiation therapy is strongly recommended for the treatment of DCIS. Adding radiation therapy to a lumpectomy that removes a cancer-free surgical margin has been shown to help stop the return of cancer within the breast. This combined treatment is called breast-conserving therapy because most of the normal breast tissue won't be removed. It is an option for many but not all women with DCIS.

Radiation therapy is given after a lumpectomy that removed cancer-free margins. See page 21 for more information on a lumpectomy. Radiation therapy uses high-energy rays to treat cancer. The rays damage the genes in cells. This either kills the cancer cells or stops new cancer cells from being made.

Most of the breast will be treated with radiation. This is called whole breast radiation. Radiation is delivered using a machine outside the body, as shown in **Figure 6**. This method of delivery is known as EBRT (external beam radiation therapy).

Before being treated with radiation, pictures of the tumor should be taken with CT (computed tomography). A CT scan takes many x-rays of the breast from different angles to make detailed pictures, called images. Before the scan, a contrast dye may be injected into your vein to make the pictures clearer. Contrast dye is a safe drug but may cause you to feel flushed or get hives. Rarely, serious allergic reactions occur. Tell your doctor if you have had bad reactions before.

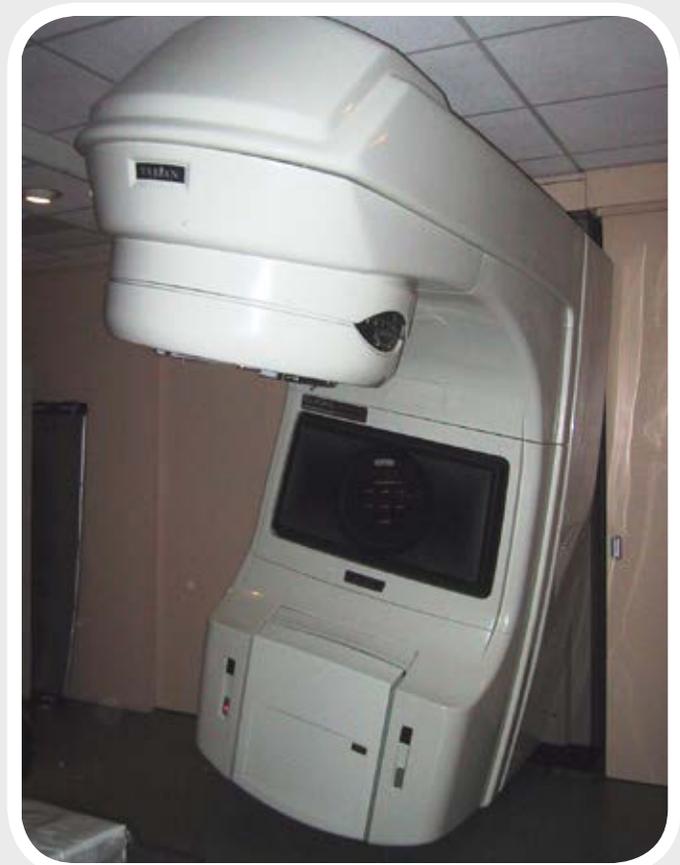
Imaging the breast before radiation is called simulation. During the scan, you will need to lie on a table that moves slowly through the tunnel in the CT machine. Your doctors will use the images to decide the radiation dose and to shape the radiation beams. Beams are shaped with computer software and

hardware added to the radiation machine. The beams are shaped so that normal tissue is spared.

There are other methods that can be used to spare normal tissue. Moreover, there are ways to protect your heart if radiation will be given in that area.

**Figure 6. EBRT machine**

**Whole-breast radiation is delivered using an EBRT machine.**



Clinac 2100 C by Zubro available at commons.  
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Ask your doctor what methods will be used for your treatment. Some methods are:

- Directing the beam not toward the heart,
- Lying face down during treatment,
- Holding your breath at times during treatment,
- Use of devices that keep you from moving during treatment,
- EBRT machines that give treatment only when the tumor is in the right spot, and
- EBRT machines that deliver very precise radiation beams. 3D machines deliver beams matched to the shape of the tumor. **IMRT** (intensity-modulated radiation therapy) uses small radiation beams of different strengths based on the thickness of the tissue.

You will be alone while a technician operates the EBRT machine from a nearby room. He or she will be able to see, hear, and speak with you at all times. As treatment is given, you may hear noises. A session can take between 15 to 30 minutes. Radiation therapy is given 5 days a week for 5 to 7 weeks.

Toward the end of treatment, you may receive extra radiation called a boost. A boost is recommended if you are 50 years old or younger. The boost may be given with EBRT or by internal radiation. Internal radiation is also called brachytherapy. It involves placing radioactive seeds in the area where the tumor

was. The seeds are placed using multiple small tubes (catheters) or one small catheter with a balloon at its end.

For multiple-catheter boost radiation, the seeds may remain in your body for minutes or days. If the seeds release a small dose of radiation, the catheters and seeds are left in your body for a few days. During this time, you must stay in the hospital. If the seeds release high doses of radiation, the seeds will remain in your body for 10 minutes. However, radiation is given twice a day for 5 days.

You may get side effects from radiation although not everyone does. Side effects are unhealthy or unpleasant physical or emotional responses to treatment. Often, the skin around the radiation site will look and feel as if it has been sunburned. Another common problem is extreme tiredness despite sleep. Women sometimes have pain in their armpit or chest after radiation and, rarely, heart and lung problems. Ask your treatment team for a complete list of rare and common side effects.

### **Partial breast irradiation**

Recently, some doctors have given radiation only to the lumpectomy site instead of giving whole breast radiation. Radiation only to the lumpectomy site is called partial breast irradiation. If you're interested in this treatment, it is recommended that you receive it only within a clinical trial. A clinical trial is a type of research that studies a test or treatment. Because of clinical trials, the tests and treatments in this book are now widely used to help patients.

### Total mastectomy

Some women with DCIS can't have breast-conserving therapy. Your doctor may suggest a mastectomy based on your health conditions, the tumor size, cancer in the margin, your chances of having another breast tumor, and how you want your breast to look after treatment. A mastectomy is strongly recommended if the following qualities describe you:

- You have DCIS that needs treatment while you are pregnant;
- You have had radiation close to the breast area with DCIS;
- You have two or more areas of DCIS that can't be removed through one cut;
- You may have cancer throughout the breast; or
- You had a lumpectomy and the surgical margin had many areas of cancer.

For DCIS, a total (also called simple) mastectomy is recommended. This surgery removes the whole breast but doesn't remove the chest muscles under the breast. It is done under general anesthesia. Often, a surgeon will make an oval-shaped cut around the nipple as shown in **Figure 7**. Next, the breast tissue will be detached from the skin and muscle so it can be removed. A total mastectomy is finished within 1 to 2 hours. Afterward, a tube may be placed in your chest to drain fluid.

A total mastectomy will leave a large scar and cause pain and swelling. You may also have stiffness, severe tiredness despite sleeping, and uncomfortable crawly sensations as your nerves heal. Ask your treatment team for a complete list of side effects.

Some women decide to have their breast re-made after a mastectomy. Surgery to rebuild a breast is called breast reconstruction. Breast reconstruction can be done while still under general anesthesia for the mastectomy or at a later time. See page 29 for more information.

**Figure 7. Total mastectomy**

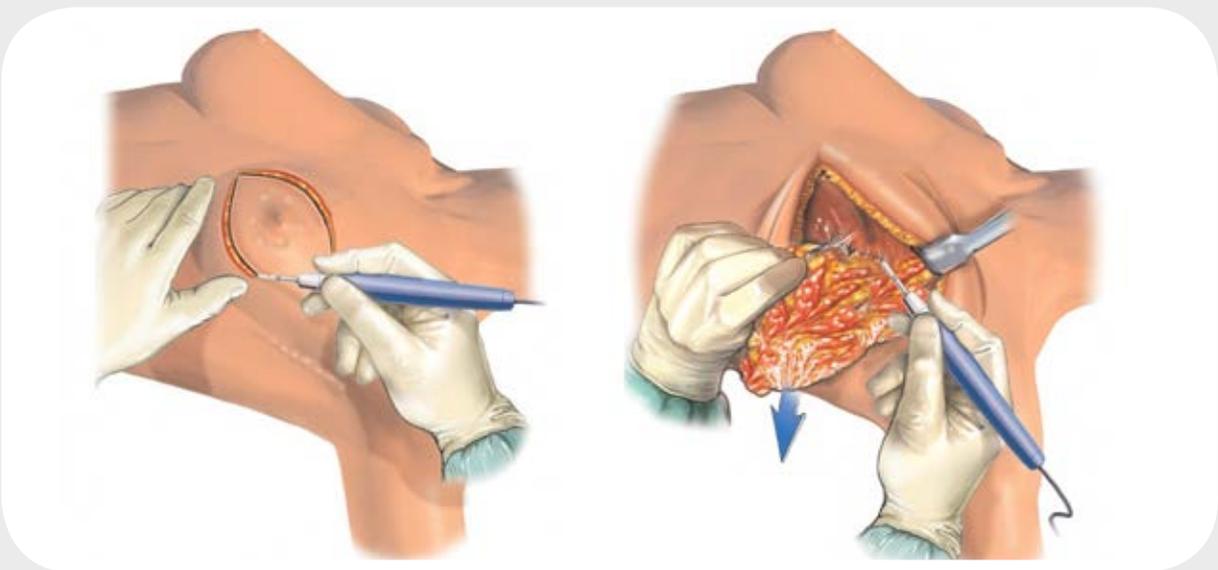


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### When you have a choice: Breast conserving therapy vs. total mastectomy

Most women with DCIS have a choice of treatment. When deciding which treatment to have, consider all the facts. It is important to know that breast-conserving therapy works as well as a total mastectomy to treat DCIS. Instead, weigh the known pros and cons of each treatment. Some are listed below. The decision aids listed on page 38 may also help.

#### Breast-conserving therapy

##### Pros

1. Natural look of your skin is kept
2. Can feel sensations in your breast since not all breast tissue is removed
3. Quicker healing time after surgery

vs

#### Total mastectomy

##### Pros

1. Reconstruct whole breast
2. Although it's no better than breast-conserving therapy, worry about recurrence may be less
3. Less likely to need radiation therapy

vs

##### Cons

1. Shapes of breasts may not match
2. Weeks of radiation and its side effects
3. Lumpectomy may not remove all DCIS so a second surgery may be needed

##### Cons

1. Loss of breast
2. Longer healing time after surgery
3. Side effects likely to be more serious than for breast-conserving therapy (eg, more swelling)

### Sentinel lymph node biopsy

A sentinel lymph node biopsy is a surgery that removes lymph nodes to test for cancer cells. It is also called a sentinel lymph node dissection. Your doctor may suggest having this biopsy during the mastectomy if it would be hard to remove your lymph nodes, if needed, afterward.

For this biopsy, a radioactive tracer is injected into your breast. A blue dye is also injected, which the surgeon can see with his or her naked eye. The radiotracer and dye drain into lymph vessels within the breast and then travel to the breast's lymph nodes. Most of these nodes are in the armpit ("axilla").

The radiotracer and dye allow your surgeon to find the first few lymph nodes to which lymph travels and to which the cancer would spread. These first few nodes are called the sentinel nodes. Often, there is more than one sentinel node to which the breast drains. After the dye marks your sentinel node(s), your surgeon removes it and likely some other nearby nodes. The nodes are then sent to a pathologist for testing.

## Risk reduction

After treatment for DCIS, some women take steps to lower their chances of having another breast tumor. This is called risk reduction. Risk reduction may help prevent a tumor from growing in either breast. The three methods of risk reduction are discussed next.

### Lifestyle changes

Changes in your lifestyle may reduce your chances of developing another breast tumor. Examples

are eating more healthfully, exercising more, and achieving a healthy body weight. Your doctor can suggest changes in lifestyle that are specific to you.

### Hormone therapy

Tamoxifen is a hormone therapy drug. It works by attaching to estrogen receptors in cancer cells, which stops the receptors from telling the cells to grow. Taking tamoxifen for 5 years is one way to reduce your chances of having another breast tumor within the breast treated with lumpectomy alone or breast-conserving therapy. Tamoxifen has been shown to help if you have hormone receptor–positive DCIS, but the gain for hormone receptor–negative DCIS is unknown. Tamoxifen and other hormone therapy drugs can also be used to prevent tumors in your breast that wasn't treated for DCIS.

Although hormone therapy can lower breast cancer risk, it can cause hot flashes, cataracts, leg cramps, blood clots, and other cancers depending on the drug. Talk to your doctor for more information. Your doctor may also know about research studies of hormone therapy or other drugs that you can join.

### Surgery

The third method of risk reduction is surgery. If you have hereditary breast cancer, you may want to have a total mastectomy of your breast that didn't have DCIS. Removing all your breast tissue greatly lowers your chances for breast cancer. Some women have breast reconstruction afterward. See page 29 for more information.

Your doctor may suggest that you have a bilateral salpingo-oophorectomy. This surgery removes both ovaries and both fallopian tubes. It is only recommended if you likely have mutations in *BRCA1* and *BRCA2* genes.

## Follow-up care

Follow-up care is important. It is done to assess your general health, find new breast tumors early, and check for side effects of treatment. The tests recommended after DCIS treatment are discussed next.

### Medical history and physical exam

After DCIS treatment, a medical history and physical exam are recommended every 6 to 12 months for 5 years. If test results are normal for 5 years, you should then have these tests every year. During your visit with your doctor, tell him or her about any new or worse symptoms you have. There may be ways to get relief. As part of your physical exam, your doctor may look inside your vagina for bleeding or other signs of disease if you are taking hormone therapy.

### Mammography

Most new breast tumors after DCIS treatment occur within the breast tissue near to the DCIS site. Thus, the first mammography should be done within 6 to 12 months after lumpectomy or breast-conserving therapy. After mastectomy, mammography is recommended every year on the breast that didn't have DCIS. If you had a mastectomy on both breasts, mammography isn't needed.



### Breast awareness

Examining your own breasts is important. You should know the feel and look of your breasts so that you can notice if significant changes have occurred. If you get menstrual periods, a self exam at the end of your period may provide the best information.

When you find changes that persist for more than a month, you should see your doctor. He or she can decide if you need more tests. Changes in breasts are often not cancer. But if there's a problem, having any changes checked by your doctor will allow you to get treatment promptly.

### Breast MRI

Your doctor may want you to get a breast MRI (magnetic resonance imaging) every year if your family has a strong history of breast cancer. Breast MRI may also be done if you've had radiation near your breast that didn't have DCIS.

Breast MRI uses powerful magnets to make pictures of the insides of your breasts. Before the test, a contrast dye may be injected into your vein to make the pictures clearer. The dye may cause you to feel flushed or get hives. Rarely, serious allergic reactions occur. Tell your doctor if you have had bad reactions before.

For a breast MRI, you must remove your top and bra and lie face down on a table. The table has padded openings for your breasts. In the openings, there are coils that help to make pictures. During breast MRI, the table moves slowly through the tunnel of the MRI machine. A breast MRI is completed in 30 to 45 minutes.



# Breast reconstruction



# 4 Breast reconstruction

30 After lumpectomy

31 After mastectomy

32 Review



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Some women choose to have breast reconstruction after a lumpectomy or mastectomy. Breast reconstruction means putting implants in or moving tissues from other body parts to make a more normal-looking breast mound.

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Other women use external fake breasts or do nothing. Part 4 gives the NCCN recommendations for breast reconstruction. Talk with your doctor about these options. For more information on breast reconstruction, visit the websites listed in Part 5.

## After lumpectomy

### Volume displacement

If you will have a lumpectomy, your breast can be re-shaped using volume displacement. Volume displacement is the shifting of the remaining breast tissue so as to fill the hole left by the lumpectomy. Shifting of the breast tissue is often done right after the lumpectomy by the cancer surgeon. A larger piece of breast tissue is removed for a volume displacement, but this likely reduces your chances of cancer returning in that breast. Another benefit is that the natural look of your breast is kept. If you don't like the results of the volume displacement, having breast revision surgery may help. Breast revision surgery is done by a plastic surgeon. You may have another volume displacement, or you may want to get implants or flaps, which are described below.

## After mastectomy

### Sparing breast skin

If you will have a total mastectomy, your surgeon may be able to save much of your breast skin. This is called a skin-sparing mastectomy. Only the nipple, areola, and skin near the biopsy site are removed. Surgery that spares the nipple and areola should only be done as part of a clinical trial.

There are benefits to having a skin-sparing mastectomy. The size of the mastectomy scar will be smaller, your breast will have a more natural shape, and you will be able to have the reconstruction right away if you want. To get the best results, your cancer and plastic surgeons need to work together.

### Timing of reconstruction

You can have reconstruction at any time if you have a total mastectomy. Reconstruction at the same time as the cancer surgery is called immediate reconstruction. Delayed reconstruction can occur months or years after the cancer surgery.

### Types of reconstruction

There are three ways to reconstruct breasts after a mastectomy. All involve having plastic surgery. Breast reconstruction is generally safe, but with any surgery, there are risks. Ask your treatment team for a complete list of side effects. The three ways to reconstruct breasts are:

#### Implants

Breasts can be reconstructed using breast implants. Breast implants are small bags filled with salt water, silicone gel, or both that are placed under the breast skin and muscle. Implants have a small risk of breaking and leaking. A balloon-like device, called an expander, may first be placed under your skin and

inflated to stretch out your muscle and skin. Every few weeks for two to three months, the expander will be enlarged until the implant will fit in place. You may feel pain from the expander stretching your skin and muscle. Some women will also have pain from the implant, scar tissue, or tissue death (necrosis).

#### Flaps

Another type of reconstruction uses tissue from your body, known as “flaps.” Tissue is taken from the belly area, butt, or from under the shoulder blade to form breasts. Some flaps are completely removed from your body and then sewn in place. Other flaps stay attached and then are slid over to the breast area and are sewn into place. Women who have diabetes or who smoke are more likely to have problems with flaps than other women. Some risks of flaps are tissue death, lumps from death of fat, and muscle weakness that may cause a hernia.

#### Implants and flaps

Some breasts are reconstructed with both implants and flaps. Using both types may give the reconstructed breast more volume and help match its shape to the other breast. However, for any reconstruction, you may need surgery on your real breast so that the two breasts match in size and shape.

#### Nipple replacement

Like your breast, you can have your nipple remade, use a fake nipple, or do nothing. The plastic surgeon can recreate a nipple mound with the surrounding tissues or, sometimes, tissue can be moved from other parts of your body, such as your vulva, thigh, or other nipple. You may lose feeling in your real nipple if tissue is removed. Tissue used from other areas of your body to make a nipple can be darkened in color with a tattoo.



# Treatment decisions



# 5 Treatment decisions

- 34 Have a treatment plan
- 35 Get a 2<sup>nd</sup> opinion
- 36 Questions to ask your doctor
- 38 Websites | Decision aids



Having carcinoma in situ can be very stressful. While absorbing the fact that you are at risk for or have cancer, you have to learn about tests and treatments and accept a treatment plan.

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Parts 2 through 4 gave the treatment recommendations of breast cancer experts from NCCN. These recommendations are based on science and agreement among NCCN experts. Part 5 has useful information on getting the best care for you.

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## Have a treatment plan

Learning that you have carcinoma in situ starts an unplanned journey to an unknown place. A treatment plan is like having a roadmap for your journey. It is a written course of action through treatment and beyond. A treatment plan for carcinoma in situ often has the following parts:

- **Your treatment team** – Cancer care is a team effort. It's helpful to have the names and contact information of all your health providers.
- **Test results** – Since breast cancers can greatly differ, test results that describe the cancer or other breast disease are included.
- **Cancer treatment** – There is no single treatment practice for all women. The treatment that you agree to have should be reported along with all known side effects.









## Websites

### American Cancer Society

[www.cancer.org/Cancer/BreastCancer/index](http://www.cancer.org/Cancer/BreastCancer/index)

### Breastcancer.org

[www.breastcancer.org](http://www.breastcancer.org)

### Cancer Support Community

[www.cancersupportcommunity.org](http://www.cancersupportcommunity.org)

### Komen Foundation

[ww5.komen.org](http://ww5.komen.org)

### Living Beyond Breast Cancer

[www.lbbc.org](http://www.lbbc.org)

### National Cancer Institute

[www.cancer.gov/cancertopics/types/breast](http://www.cancer.gov/cancertopics/types/breast)

### National Coalition for Cancer Survivorship

[www.canceradvocacy.org](http://www.canceradvocacy.org)

## Decision aids

For breast conserving therapy vs mastectomy:

### National Cancer Institute

[www.cancer.gov/cancertopics/treatment/breast/surgerychoices](http://www.cancer.gov/cancertopics/treatment/breast/surgerychoices)

### WebMD

[www.webmd.com/breast-cancer/should-i-have-breast-conserving-surgery-or-a-mastectomy-to-treat-early-stage-breast-cancer](http://www.webmd.com/breast-cancer/should-i-have-breast-conserving-surgery-or-a-mastectomy-to-treat-early-stage-breast-cancer)

## Review

- Having a treatment plan is like having a roadmap for your journey.
- Getting a 2<sup>nd</sup> opinion may help you feel more at peace about your treatment plan.
- Ask your doctors questions about testing and treatment.
- More information on the tests and treatments described in this book can be found on the internet.
- Decision aids are another resource that may help you decide between breast-conserving therapy and mastectomy.

# Glossary

Dictionary  
Acronyms

# Dictionary

**areola**

A darker, circular area of skin on the breast surrounding the nipple.

**axillary lymph node**

Group of special disease-fighting cells located near the armpit.

**bilateral**

Involving both sides of the body or both breasts.

**bilateral salpingo-oophorectomy**

Surgery that removes both ovaries and both fallopian tubes.

**biopsy**

Removal of small amounts of tissue or fluid to be tested for disease.

**boost**

An extra dose of radiation to a specific area of the body.

**brachytherapy**

Radiation received from a radioactive object placed near or in the tumor.

**breast-conserving therapy**

Cancer treatment that includes removing the breast lump and radiation therapy.

**breast implant**

A small bag filled with salt water, gel, or both that is used to remake breasts.

**breast reconstruction**

Surgery to rebuild breasts.

**cancer stage**

Rating of the growth and spread of tumors.

**carcinoma**

Cancer that starts in cells that form the lining of organs and structures in the body.

**carcinoma in situ**

Abnormal or cancer cells have not grown into the next layer of tissue.

**cataract**

A health condition in which the lens of the eye becomes cloudy.

**catheter**

A flexible tube inserted in the body to give treatment or drain fluid from the body.

**clinical breast exam**

A physical exam of the breasts by a health professional to feel for disease.

**clinical trial**

Research on a test or treatment to assess its safety or how well it works.

**computed tomography (CT)**

A test that uses x-rays from many angles to make a picture of the inside of the body.

**connective tissue**

Supporting and binding tissue that surrounds other tissues and organs.

**contrast**

A dye put into your body to make clearer pictures during imaging tests.

**core needle biopsy**

Use of a needle to remove a large tissue sample to test for cancer cells.

**diabetes**

A disease that causes high levels of blood sugar.

**duct**

A tube in the breast that drains breast milk.

**ductal carcinoma in situ (DCIS)**

Cancer that started within and hasn't grown beyond the breast ducts.

**estrogen**

A hormone that develops female body traits.

**excisional biopsy**

Surgery that removes an entire tumor to test for cancer cells.

**external beam radiation therapy (EBRT)**

Treatment with radiation received from a machine outside the body.

**fine-needle aspiration (FNA)**

Removal of a small tissue sample with a very thin needle.

**gene**

Coded instructions in cells for making new cells and controlling how cells behave.

**general anesthesia**

A controlled loss of wakefulness from drugs.

**genetic counseling**

Discussion with a health expert about the risk for a disease caused by changes in genes.

**hereditary**

Passed down from parent to child through coded information in cells.

**hernia**

A health condition in which muscles weaken or tear allowing organs or tissue to extend out.

**hormone**

Chemical in the body that activates cells or organs.

**hormone receptor**

Proteins inside of cells that bind with hormones.

**hormone receptor–negative**

Cancer cells that don't use hormones to grow.

**hormone receptor–positive**

Cancer cells that use hormones to grow.

**hormone therapy**

Treatment that stops the making or action of hormones in the body.

**hot flashes**

A health condition of intense body heat and sweat for short periods.

**immunohistochemistry (IHC)**

A lab test of cancer cells to find specific cell traits involved in abnormal cell growth.

**in situ**

In its original place – cancer cells have not spread from where they first formed.

**incisional biopsy**

A minor surgery that removes a tissue sample from a tumor.

**internal radiation**

Treatment with radiation received from an object placed near or in the tumor.

**invasive breast cancer**

Cancer cells have grown into the supporting tissue of the breast.

**lobular carcinoma in situ (LCIS)**

Abnormal cells within the breast lobules only.

**lobule**

A gland in the breast that makes breast milk.

**local anesthesia**

A controlled loss of feeling in a small area of the body from drugs.

**lumpectomy**

Surgery to remove a breast lump and some normal tissue around it.

**lymph**

A clear fluid containing white blood cells.

**lymph node**

Small groups of special disease-fighting cells located throughout the body.

**magnetic resonance imaging (MRI)**

A test that uses radio waves and powerful magnets to make pictures of the insides of the body.

**mammogram**

A picture of the insides of the breast that is made by an x-ray test.

**mammography**

A test that uses x-rays to make pictures of the inside of the breast.

**mastectomy**

Surgery to remove the whole breast.

**medical history**

All health events and medications taken to date.

**multiple-catheter radiation**

Use of multiple small tubes to place radioactive seeds in your body for treatment.

**mutation**

An abnormal change in the instructions in cells for making and controlling cells.

**needle biopsy**

Use of a needle to remove tissue for testing.

**noninvasive breast cancer**

Cancer cells have not grown into the supporting tissue of the breast.

**partial breast irradiation**

Treatment with radiation that is only directed at the surgery site.

**pathologist**

A doctor who's an expert in testing cells and tissue to find disease.

**physical exam**

A review of the body by a health expert for signs of disease.

**primary tumor**

The first mass of cancer cells in the body.

**progesterone**

A hormone in women that is involved in sexual development, menstruation, and pregnancy.

**puberty**

The time when teens sexually develop.

**radiation therapy**

The use of high-energy rays to destroy cancer cells.

**risk factor**

Something that increases the chance of getting a disease.

**risk reduction**

Something that is done to try to lessen the chance of getting a disease.

**sentinel lymph node biopsy**

Surgery to remove the first lymph node(s) to which cancer cells spread after leaving the breast tumor. Also called sentinel lymph node dissection.

**sentinel node**

The first lymph node to which cancer cells spread after leaving the breast tumor.

**side effect**

An unhealthy physical or emotional response to treatment.

**simple mastectomy**

Surgery that removes the entire breast but no chest muscles. Also called total mastectomy.

**simulation**

The steps needed to prepare for treatment with radiation.

**skin-sparing mastectomy**

A surgery that removes all breast tissue but saves as much breast skin as possible.

**stereotactic-guided biopsy**

Use of mammography to guide a needle into a breast tumor to remove samples.

**stroma**

Supportive tissue in the breast.

**surgeon**

A doctor who's an expert in operations to remove or repair a part of the body.

**surgical margin**

The normal tissue around the edge of a tumor that is removed during surgery.

**tamoxifen**

A drug that lowers the amount of estrogen in the body.

**total mastectomy**

Surgery that removes the entire breast but no chest muscles. Also called simple mastectomy.

**treatment plan**

A written course of action through cancer treatment and beyond.

**ultrasound**

Use of sound waves to make pictures of the insides of the body.

**ultrasound-guided biopsy**

Use of ultrasound to guide a needle into a breast tumor to remove samples.

**vulva**

The female organs between the legs.

**whole breast radiation**

Treatment of the entire breast with radiation from a machine outside the body.

**wire localization biopsy**

Use of wire guided into a tumor by mammography to find the right spot for removing tissue samples.

# Acronyms

**CBE**

clinical breast exam

**CT**

computed tomography

**DCIS**

ductal carcinoma in situ

**EBRT**

external beam radiation therapy

**FNA**

fine-needle aspiration

**IHC**

immunohistochemistry

**IMRT**

intensity-modulated radiation therapy

**LCIS**

lobular carcinoma in situ

**MRI**

magnetic resonance imaging

## NCCN Abbreviations and Acronyms

**NCCN®**

National Comprehensive Cancer Network®

**NCCN Patient Guidelines®**

NCCN Guidelines for Patients®

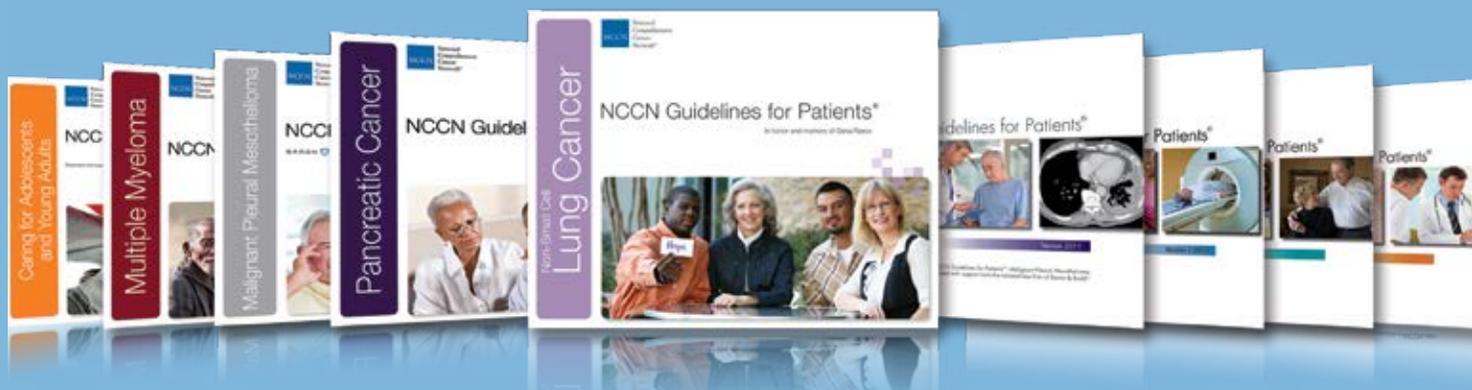
**NCCN Guidelines®**

NCCN Clinical Practice Guidelines in Oncology®

# NCCN Guidelines for Patients®

The same authoritative sources referenced by physicians and other health care professionals are available for patients:

- Caring for Adolescents and Young Adults
- Chronic Myelogenous Leukemia
- Colon Cancer
- Esophageal Cancer
- Lung Cancer Screening
- Malignant Pleural Mesothelioma
- Melanoma
- Multiple Myeloma
- Non-Small Cell Lung Cancer
- Ovarian Cancer
- Pancreatic Cancer
- Prostate Cancer
- Stage 0 Breast Cancer
- Stages I and II Breast Cancer
- Stage III Breast Cancer
- Stage IV Breast Cancer



Available at [NCCN.org/patients](http://NCCN.org/patients)

To request a printed copy, e-mail: [patientguidelines@nccn.org](mailto:patientguidelines@nccn.org)



[NCCN.org/patients](http://NCCN.org/patients) – For Patients | [NCCN.org](http://NCCN.org) – For Clinicians

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[nebraskamed.com/cancer](http://nebraskamed.com/cancer)

City of Hope Comprehensive Cancer Center  
Los Angeles, California  
800.826.4673  
[cityofhope.org](http://cityofhope.org)

Dana-Farber/Brigham and Women's Cancer Center Massachusetts General Hospital Cancer Center  
Boston, Massachusetts  
877.332.4294  
[dfbicc.org](http://dfbicc.org)  
[massgeneral.org/cancer](http://massgeneral.org/cancer)

Duke Cancer Institute  
Durham, North Carolina  
888.275.3853  
[dukecancerinstitute.org](http://dukecancerinstitute.org)

Fox Chase Cancer Center  
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888.369.2427  
[foxchase.org](http://foxchase.org)

Huntsman Cancer Institute at the University of Utah  
Salt Lake City, Utah  
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The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins  
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410.955.8964  
[hopkinskimmelcancercenter.org](http://hopkinskimmelcancercenter.org)

Robert H. Lurie Comprehensive Cancer Center of Northwestern University  
Chicago, Illinois  
866.587.4322  
[cancer.northwestern.edu](http://cancer.northwestern.edu)

Mayo Clinic Cancer Center  
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Jacksonville, Florida  
Rochester, Minnesota  
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904.953.0853 • Florida  
507.538.3270 • Minnesota  
[mayoclinic.org/departments-centers/mayo-clinic-cancer-center](http://mayoclinic.org/departments-centers/mayo-clinic-cancer-center)

Memorial Sloan Kettering Cancer Center  
New York, New York  
800.525.2225  
[mskcc.org](http://mskcc.org)

Moffitt Cancer Center  
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[moffitt.org](http://moffitt.org)

The Ohio State University Comprehensive Cancer Center - James Cancer Hospital and Solove Research Institute  
Columbus, Ohio  
800.293.5066  
[cancer.osu.edu](http://cancer.osu.edu)

Roswell Park Cancer Institute  
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[roswellpark.org](http://roswellpark.org)

Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine  
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[siteman.wustl.edu](http://siteman.wustl.edu)

St. Jude Children's Research Hospital/The University of Tennessee Health Science Center  
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University of Alabama at Birmingham Comprehensive Cancer Center  
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[www3.ccc.uab.edu](http://www3.ccc.uab.edu)

UC San Diego Moores Cancer Center  
La Jolla, California  
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[cancer.ucsd.edu](http://cancer.ucsd.edu)

UCSF Helen Diller Family Comprehensive Cancer Center  
San Francisco, California  
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[cancer.ucsf.edu](http://cancer.ucsf.edu)

University of Colorado Cancer Center  
Aurora, Colorado  
720.848.0300  
[coloradocancercenter.org](http://coloradocancercenter.org)

University of Michigan Comprehensive Cancer Center  
Ann Arbor, Michigan  
800.865.1125  
[mcancer.org](http://mcancer.org)

The University of Texas MD Anderson Cancer Center  
Houston, Texas  
800.392.1611  
[mdanderson.org](http://mdanderson.org)

Vanderbilt-Ingram Cancer Center  
Nashville, Tennessee  
800.811.8480  
[vicc.org](http://vicc.org)

Yale Cancer Center/Smilow Cancer Hospital  
New Haven, Connecticut  
855.4.SMILOW  
[yalecancercenter.org](http://yalecancercenter.org)

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