



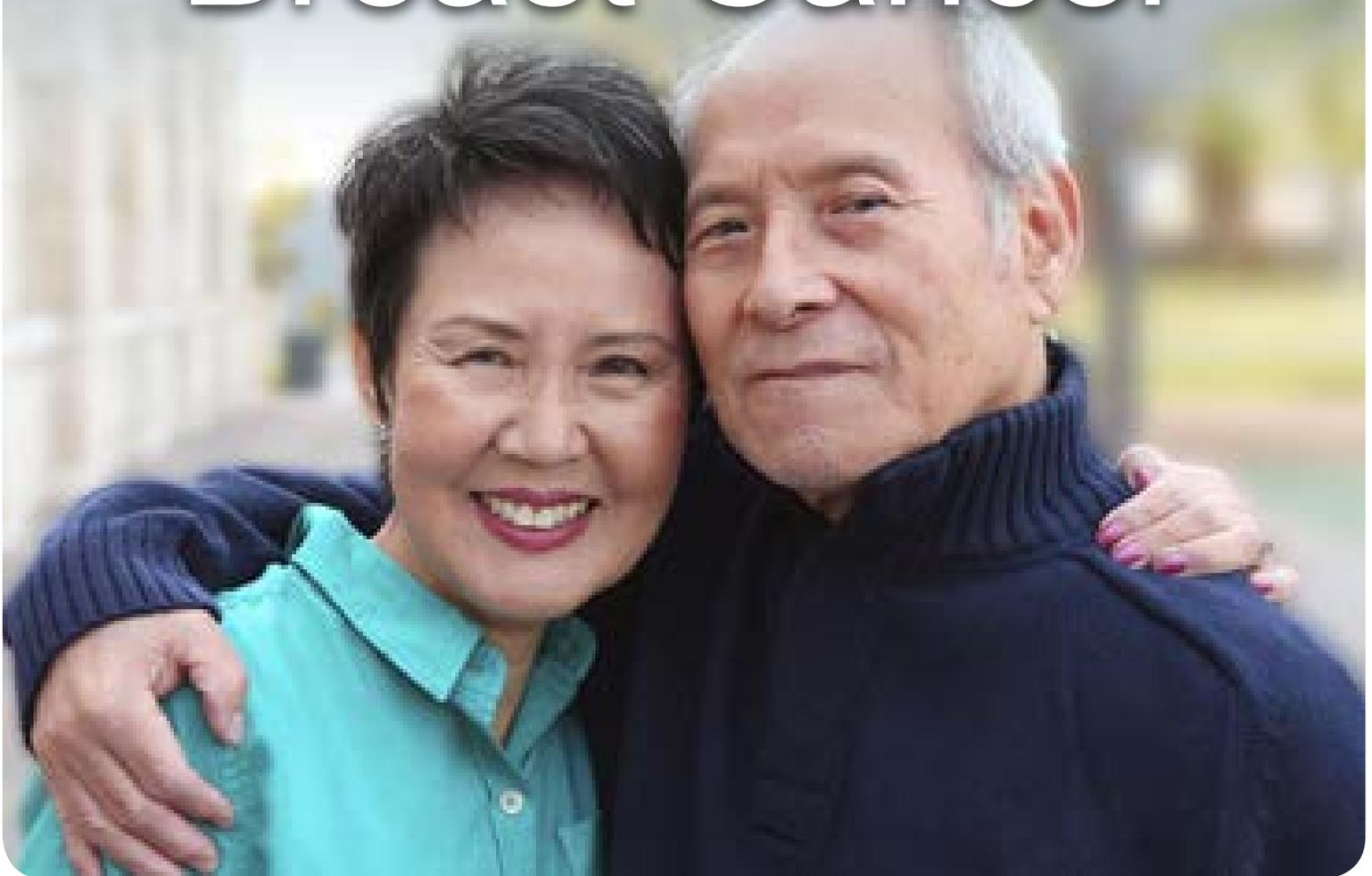
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NCCN Guidelines for Patients®

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# Stage III Breast Cancer



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# Stage III 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 by experts for common stage III breast cancers.

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 III 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 common stage III breast cancers. 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.

Panels 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).

NCCN staff involved in making the guidelines for patients and doctors include:

#### **NCCN Patient Guidelines**

Dorothy A. Shead, MS  
*Director, Patient and Clinical  
Information Operations*

Laura J. Hanisch, PsyD  
*Medical Writer/  
Patient Information Specialist*

Lacey Marlow  
*Associate Medical Writer*

#### **NCCN Guidelines**

Rashmi Kumar, PhD  
*Oncology Scientist/Senior Medical Writer*

#### **NCCN Marketing**

Susan Kidney  
*Graphic Design Specialist*

#### **NCCN Drugs & Biologics Programs**

Rachael Clarke  
*Medical Copyeditor*



#### **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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National Comprehensive Cancer Network (NCCN)  
275 Commerce Drive • Suite 300  
Fort Washington, PA 19034  
215.690.0300

# Stage III Breast Cancer

- 4** How to use this book
- 5** **Part 1**  
**Breast cancer basics**  
Explains how breast cancer starts and how it spreads.
- 9** **Part 2**  
**Treatment planning**  
Describes which tests are used to plan cancer treatment.
- 21** **Part 3**  
**Chemotherapy and HER2 inhibitors**  
Explains the use of these drugs before and after surgery.
- 31** **Part 4**  
**Breast surgery and reconstruction**  
Describes the operations to remove cancer and rebuild breasts.
- 39** **Part 5**  
**Radiation therapy**  
Describes how this treatment is given and to whom.
- 45** **Part 6**  
**Hormone therapy**  
Describes who should have which type of hormone therapy.
- 51** **Part 7**  
**Follow-up care**  
Presents the recommended plan for long-term care.
- 55** **Part 8**  
**Treatment for recurrence**  
Presents the recommended treatment if the cancer returns.
- 61** **Part 9**  
**Making treatment decisions**  
Offers tips for getting a treatment plan that meets all your needs.
- 67** **Glossary:**
  - 68** Dictionary
  - 72** Acronyms
- 75** NCCN Panel Members
- 76** NCCN Member Institutions
- 78** Index

## Who should read this book?

This book is about treatment for stage III breast cancer among women. Patients and those who support them—caregivers, family, and friends—may find this book helpful. It may help you discuss and decide with doctors what care is best. As you read through this book, you may find it helpful to create a list of questions to ask your doctors.

## Where should I start reading?

Starting with Part 1 may be helpful for many people. It explains what stage III breast cancer is. Part 2 lists the recommended tests that help doctors plan treatment.

Clinical trials are the preferred treatment option for breast cancer. They are explained at the end of Part 2. Parts 3 through 8 are a step-by-step guide to other treatment options that are based on the best science that exists for stage III breast cancer. If you choose not to join a clinical trial, these chapters have specific recommendations. Part 9 offers some helpful tips on getting the best care.

## Does the whole book apply to me?

There is important information in this booklet for many situations. Thus, you will likely not get every test and treatment listed. Your treatment team can point out what applies to you and give you more information.

The recommendations in this book include what NCCN experts feel is the most useful based on science and their experience. 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 your treatment team suggests other tests or treatments, feel free to ask them why.

## 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 on 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 MRI for **m**agnetic **r**esonance **i**maging.



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1

# Breast cancer basics



# 1 Breast cancer basics

- 6 Women's breasts
- 6 Breast cancer
- 8 Stage III breast cancer
- 8 Review



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You've learned that you have breast cancer. It's common to feel shocked and confused. Part 1 reviews some basics about breast cancer that may help you start to cope. These basics may also help you start planning for treatment.

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## Women's breasts

### A look inside

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 ends of the ducts like leaves at the ends 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.

## Breast cancer

### Uncontrolled cell growth

Breast cancer is a disease of cells—the building blocks of tissue in the body. Almost all breast cancers are carcinomas. Carcinomas are cancers that start in cells that line the inner (ducts, lungs, or gut) or outer (skin) surfaces of the body. In the breast, carcinomas start in the cells lining either the ducts or lobules, but most breast cancers start in ductal cells.

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. Cancer cells don't behave like normal cells in three key ways.

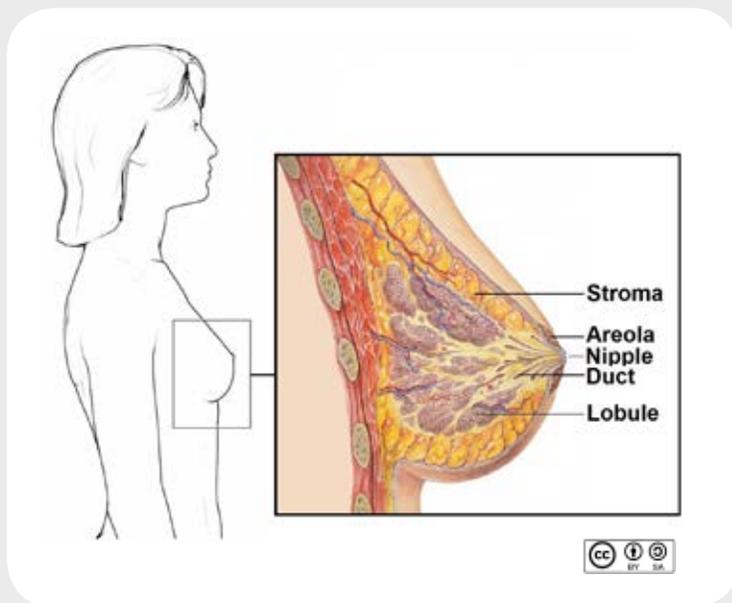
First, the changes in genes cause cancer cells to make too many copies of themselves. Normal cells divide and multiply when new cells are needed, but otherwise live in a resting state. Normal cells also die when old or damaged. In contrast, cancer cells make new cells that aren't needed and don't die 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 have grown into the stroma, such as stage III, are called "invasive."

Third, unlike normal cells, cancer cells can break off from the primary tumor and form secondary tumors. Secondary tumors may form in the breast or in other parts of the body. Breast cancer can spread to other body parts through blood or lymph vessels that are in the stroma.

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. Other nearby lymph nodes include those just inside the ribs near the breast bone (internal mammary nodes), those right below the collarbone (infraclavicular nodes), and those right above the collarbone (supraclavicular nodes).

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 under a Creative Commons Attribution 3.0 Unported license.

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Figure 2. Axillary lymph nodes

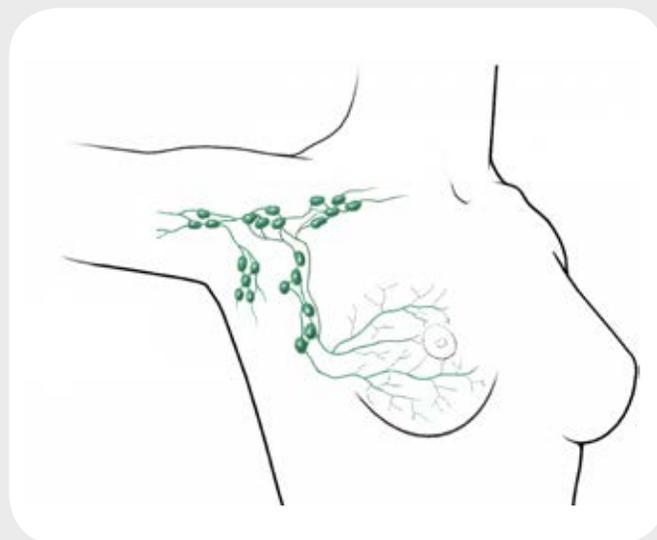


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## Stage III breast cancer

### Advanced breast cancer

Cancer staging is a rating by your doctors of the extent of the cancer. It is used to plan which tests may be needed and which treatments are best for you. The AJCC (**A**merican **J**oint **C**ommittee on **C**ancer) staging system is used to stage breast cancer. In this system, the letters T, N, and M describe a different area of cancer growth. The T score describes the growth of the primary tumor. The N score describes cancer growth within nearby lymph nodes. The M score tells if the cancer has spread to distant sites.

The T, N, and M scores are combined to assign the cancer a stage. Scoring of the cancer stage is often done twice. The first scoring is based on tests before treatment and is called the clinical stage. Exactly how far the cancer has spread and how many axillary lymph nodes have cancer isn't known until after surgery. Thus, your doctors will score the cancer again. These scores are called the pathologic stage.

**Stage IIIA.** Some of these breast tumors are larger than 5 centimeters but don't involve the breast skin or chest wall. Testing suggests the cancer has spread to the axillary lymph nodes, but the nodes can be moved if pushed. They can be moved because the cancer

hasn't caused the nodes to grow together or into other tissues. The TNM scores for these tumors are T3, N1, M0.

Other stage IIIA breast tumors may be of any size or not found. If there's a breast tumor, it doesn't involve the breast skin or chest wall. Testing suggests cancer in the axillary lymph nodes, which can't be moved, or there's cancer in the internal mammary nodes. The TNM scores for these tumors are T0, N2, M0; T1, N2, M0; T2, N2, M0; or T3, N2, M0.

**Stage IIIB.** These breast tumors involve the breast skin, chest wall, or both. If in the skin, the skin has open sore(s), small secondary tumor(s), or is swollen. Tests suggest there's no cancer in the lymph nodes, there's cancer in axillary nodes, or there's cancer in the internal mammary nodes. The TNM scores for these tumors are T4, N0, M0; T4, N1, M0; or T4, N2, M0.

**Stage IIIC.** A breast tumor may or may not have been found but the cancer appears to have spread far into nearby lymph nodes. Tests suggest there's cancer in the axillary and internal mammary nodes, in infraclavicular nodes, or in supraclavicular nodes. The TNM scores for these tumors are Any T (T0 – T4), N3, M0.

## Review

- Inside of women's breasts are milk ducts, lobules that can make milk, and fatty tissue called stroma.
- Breast cancer often starts in the milk ducts or lobules and then spreads into the stroma.
- Breast cancer can spread outside the breast through lymph or blood.
- Stage III breast cancers have grown beyond the stroma.

# Treatment planning



# 2 Treatment planning

10	General health tests
11	Blood tests
12	Imaging tests
14	Cancer cell tests
16	Lymph node biopsy
17	Genetic counseling
17	Fertility counseling
18	Clinical trials
20	Review



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You've learned that you have breast cancer. The next step is to plan the best treatment. Your doctors will choose which treatments you should have based on the cancer, your overall health, and other factors. Part 2 describes the recommended tests for clinical stage III breast cancer.

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## General health tests

### Q&A plus body check

#### Medical history

Your medical history includes any health events in your life and any medications you've taken. Your doctors will want to know about all your illnesses, breast biopsies, any prior radiation therapy, 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 doctors 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



## Imaging tests

### Seeing inside of your body

Imaging tests make pictures of the insides of your body. The pictures can show how far the cancer has spread. Getting an imaging test is often easy. Depending on the test, you may need to stop taking some medicines, stop eating and drinking for a few hours, and remove metal objects from your body.

### Breast imaging

#### Diagnostic bilateral mammography

Mammography uses x-rays to make pictures of the insides of the breast. These pictures are called mammograms. A bilateral mammography takes pictures of both breasts. Mammography that is used for breast cancer screening often takes two pictures

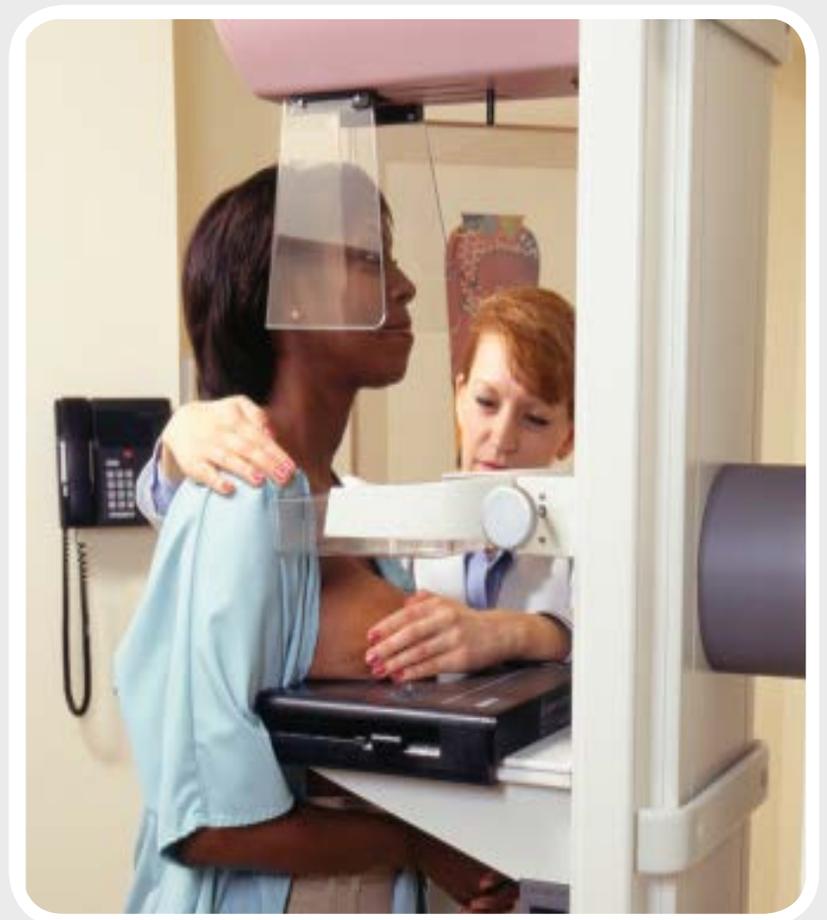
of each breast. Diagnostic mammography may take more pictures from different angles. Diagnostic bilateral mammography is recommended to see the size of the breast tumor and if there are other abnormal areas in either breast.

Before mammography, wash off any deodorant, perfume, powder, or lotion on your breasts and armpits. These products can block pictures. 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 **Figure 3**, 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

**Figure 3. 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 may take more pictures from different angles.



breast tissues. Your breast will remain flattened for a few minutes while pictures are taken from a camera that is attached to the two plates.

The pictures will be 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 doctors. If the mammograms aren't clear, the next two imaging tests may be used.

### Ultrasound

Ultrasound is a test that uses sound waves to make pictures. For this test, you will need to lie down on a table. Next, a technician or doctor will hold the ultrasound probe on top of your breast. The probe may also be placed below your armpit to view your lymph nodes. Ultrasound isn't commonly used for breast cancer but may be used when mammograms are unclear.

### Breast MRI

If the mammography and ultrasound images are unclear, your doctors may want you to get a breast MRI (magnetic resonance imaging). This test uses radio waves and powerful magnets to make pictures. Before the test, a contrast dye that makes the pictures clearer may be injected into your vein. The dye may cause you to feel flushed or get hives. Rarely, serious allergic reactions occur. Tell your doctors 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 a breast MRI, the table moves slowly through the tunnel of the MRI machine.

### Other imaging tests

Besides your breasts, imaging tests can be used to view other body parts. Your doctors may want you to have more imaging tests based on your symptoms or other test results. Possible other imaging tests include:

#### Chest diagnostic CT

CT (computed tomography) takes many x-rays from different angles to make detailed pictures. You may get a CT scan of your chest if you have symptoms of lung disease. The CT scan can help show if the symptoms are caused by cancer or another health problem. Like a breast MRI, a contrast dye may be used. For the CT scan, you will need to lie face up on a table that moves through the machine.

#### Abdominal/pelvic diagnostic scans

CT and MRI scans can be used to see the insides of your abdomen and pelvis. If you have symptoms in these areas, a scan can help show if the symptoms are caused by cancer or another health problem. Your doctors may also order a scan of these areas if the physical exam, ALP blood test, or liver functioning tests suggest a health problem.

#### Bone scan

A bone scan can be used to see if the cancer has spread to your bones. It is recommended if you have bone pain or if your ALP blood levels are high. Before the pictures are taken, a radiotracer will be injected into your vein. The most common radiotracer used for bone scans is technetium. You will need to wait about 3 hours for the radiotracer to enter your bones. A special camera is used to take pictures while you lie still on a table. **See Figure 4**, page 14. It takes 45 to 60 minutes to complete the pictures. Areas of bone damage use more radiotracer than healthy bone and thus appear as bright spots. Bone damage can be caused by cancer as well as other health problems.

### Sodium fluoride PET/CT

Instead of a bone scan, PET (positron emission tomography) and CT scans can be used to image bones. Some cancer centers have an imaging machine that does both scans. At other centers, the scans are done with two machines. Like a bone scan, PET also uses a radiotracer to see the activity of cells. The radiotracer used to image bone with PET is sodium fluoride. Sodium fluoride PET/CT is a costly test but shows areas of bone damage and repair better than a bone scan. It also has a shorter waiting time of 40 to 60 minutes for the radiotracer to be seen and a shorter scanning time of 15 to 20 minutes than a bone scan.

### FDG PET/CT

Another type of PET used to see if breast cancer has spread is FDG (fluorodeoxyglucose) PET/CT. FDG is a radiotracer that is made of fluoride and a simple form of sugar (glucose). Cancer cells use more FDG than normal cells and thus show up as bright spots

on pictures. For this test, you must fast for 4 hours or more. FDG PET/CT is most helpful when other imaging tests are unclear and may be helpful with finding breast cancer that has spread to lymph nodes or distant sites.

## Cancer cell tests

### Measuring cell features

Not all breast cancer cells are alike. Cancer cells can differ by the type of receptors they have. A receptor is a protein found in the membrane of cells or inside of cells. Substances bind to the receptors and start changes within the cell. The two types of receptors important for treatment planning are:

### Hormone receptor test

Estrogen and progesterone are hormones that increase during puberty in girls causing their breasts to grow. For some breast cancers, the cancer cells

**Figure 4. Bone scan machine**

**A bone scan can be used to see if the cancer has spread to your bones.**



Gamma Camera by Brendaicm available at [commons.wikimedia.org/wiki/File:Gamma\\_camera.jpg](https://commons.wikimedia.org/wiki/File:Gamma_camera.jpg) under a Creative Commons Attribution-Share Alike 3.0 Unported.





## Pathology report

A pathologist is a doctor who's an expert in testing cells to find diseases. This doctor confirms that cancer is present by viewing a sample of cells with a microscope. When cancer is found, he or she will do other tests, such as those described in *Cancer cell tests*, to learn more about the cancer. 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. A biopsy removes tissue or fluid samples from the breast with a needle, probe, or surgical knife. 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.

have a high number of hormone receptors. When hormones attach to the receptors, the cancer cells grow and divide forming new cancer cells.

Testing for hormone receptors is important because there are drugs that stop hormones from causing cancer growth. IHC (immunohistochemistry) is the lab test that most pathologists use to see if cancer cells have hormone receptors. The cancer cells are stained to see the number of cells with hormone receptors. If at least 1 out of every 100 cancer cells stains positive, the cancer is called hormone receptor–positive. If fewer cancer cells stain positive for hormone receptors, the cancer is called hormone receptor–negative.

### HER2 receptor tests

In normal breast cells, there are two copies of the gene that makes HER2 (human epidermal growth factor receptor 2). HER2 is found within the membrane of cells. This type of receptor is called a surface receptor.

When HER2 is activated, it causes breast cancer cells to grow and divide. Some breast cancers have cells with more than two copies of the HER2 gene causing too many HER2 receptors to be made. Other breast cancers have cells with only two HER2 gene copies but still too many HER2 receptors are made.

With too many HER2 receptors, breast cancer cells grow and divide fast. However, there are drugs to stop these cancer cells from growing. Due to high costs and the side effects of these drugs, it is very important to have tests that correctly show HER2 status. Like for hormone receptors, IHC is used to count the number of HER2 receptors. An IHC score of 3+ means that the cancer cells have many HER2 receptors. Another test of HER2 is ISH (in situ hybridization). ISH counts the number of copies of the HER2 gene. If the cancer cells have too many HER2 genes or receptors, the cancer is called HER2 positive.

## Lymph node biopsy

### Removing tissue samples

You've learned that you have cancer in your breast, but the cancer may have spread to your lymph nodes. If your lymph nodes feel large upon physical exam or don't look normal in imaging tests, there is a higher chance that cancer is in them. To tell if cancer is present in your nodes, a sample of tissue must be removed. The removal of tissue is called a biopsy. A biopsy is generally a safe test.

Before a biopsy, you may be asked to stop eating, stop taking some medicines, or stop smoking. For a needle biopsy, your doctor will insert a needle through your skin into your lymph node. See **Figure 5** for pictures of needle biopsies. The biopsy samples will be sent to a lab and tested for cancer cells. Further testing of your

lymph nodes may be done at the time of surgery even if the physical exam, imaging tests, and biopsy results are normal. The two needle biopsies for lymph nodes are:

### FNA

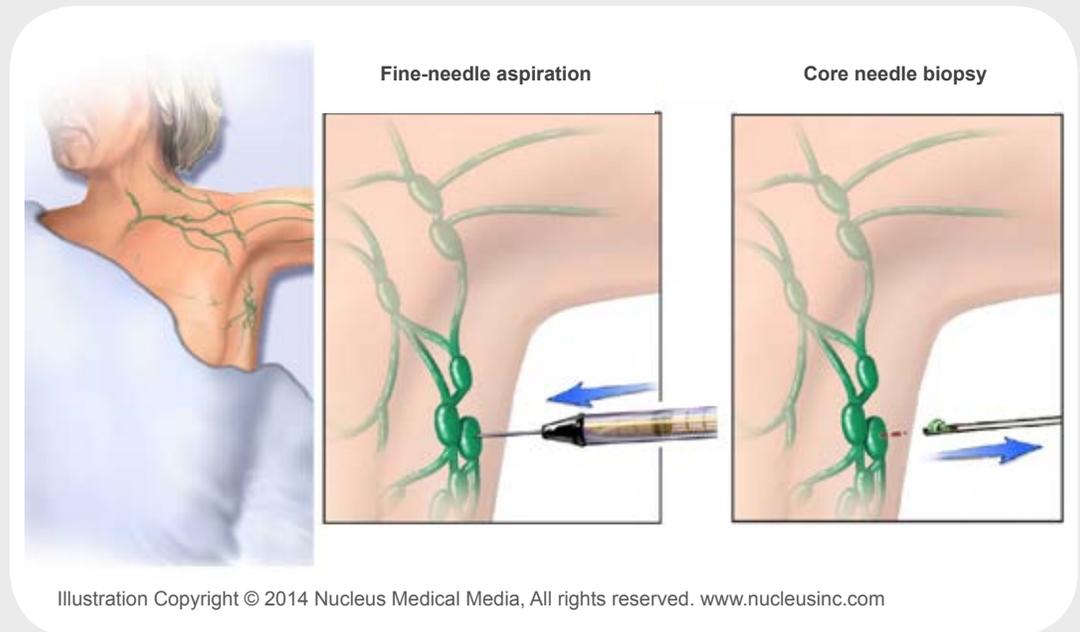
An FNA (fine-needle aspiration) uses a very thin needle and syringe to remove a small group of cells from a node. Ultrasound may be used to guide the needle into the node. This biopsy takes a few minutes to complete.

### Core needle biopsy

The needle used in a core needle biopsy is able to remove a solid tissue sample. Like FNA, ultrasound may be used to guide the needle into the node. Local anesthesia is given to reduce pain.

**Figure 5. Lymph node biopsies**

The two types of needle biopsies are fine-needle aspiration (FNA) and core needle biopsy.



## Genetic counseling

### Assessing for hereditary breast cancer

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 age, medical history, and family history, your doctor will assess how likely you are to have hereditary breast cancer. If the likelihood is high, you should see 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 to 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.

## Fertility counseling

### Talking about having babies

If you still have menstrual periods, your doctors will have important information to share with you. First, it is important that you not get pregnant during most cancer treatments. Cancer treatments may harm your baby. Your doctors can tell you which birth control methods are best to use while on treatment.

Second, some breast cancer treatments may affect your ability to have babies in the future. If you want the choice of having babies after treatment or are unsure, tell your doctors. After treatment has ended, some women decide they want to have another baby. If you still have menstrual periods, it may help to talk with a fertility specialist before you begin cancer treatment. A fertility specialist is an expert in helping women get pregnant. The fertility specialist can discuss with you ways to help you have a baby after treatment.





New tests and treatments go through a series of clinical trials to make sure they're safe and work. Without clinical trials, there is no way to know if a test or treatment is safe or helpful.

## Clinical trials

Doctors plan treatment based on test results, your overall health, your wishes, and other factors. One option for treatment is joining a clinical trial. Clinical trials are the treatment option that is preferred by NCCN experts. Some basic information about clinical trials is given below.

New tests and treatments aren't offered to the public as soon as they're made. They need to be studied. A clinical trial is a type of research that studies a test or treatment. Clinical trials study how safe and helpful tests and treatments are. When found to be safe and helpful, they may become tomorrow's standard of care. Because of clinical trials, the tests and treatments in this booklet are now widely used to help patients.

### Clinical trials have four phases:

Phase I trials	Aim to find the best dose of a new drug with the fewest side effects.
Phase II trials	Assess if a drug works for a specific type of cancer.
Phase III trials	Compare a new drug to the standard treatment.
Phase IV trials	Test new drugs approved by the FDA ( <b>F</b> ood and <b>D</b> rug <b>A</b> dministration) in many patients with different types of cancer.

**Joining a clinical trial has benefits.**

First, you'll have access to the most current cancer care. Second, you will receive the best management of care. Third, the results of your treatment—both good and bad—will be carefully tracked. Fourth, you may help other patients with cancer.

**Clinical trials have risks, too.**

Like any test or treatment, there may be side effects. Also, new tests or treatments may not help. Another downside may be that paperwork or more trips to the hospital are needed.

**To join a clinical trial, you must meet the conditions of the study.**

Patients in a clinical trial are often alike in terms of their cancer and general health. This is to know that any progress is because of the treatment and not

because of differences between patients. To join, you'll need to review and sign a paper called an informed consent form. This form describes the study in detail, including the risks and benefits.



Ask your treatment team if there is an open clinical trial that you can join. There may be clinical trials where you're getting treatment or at other treatment centers nearby. You can also find clinical trials through the websites listed in Part 9.

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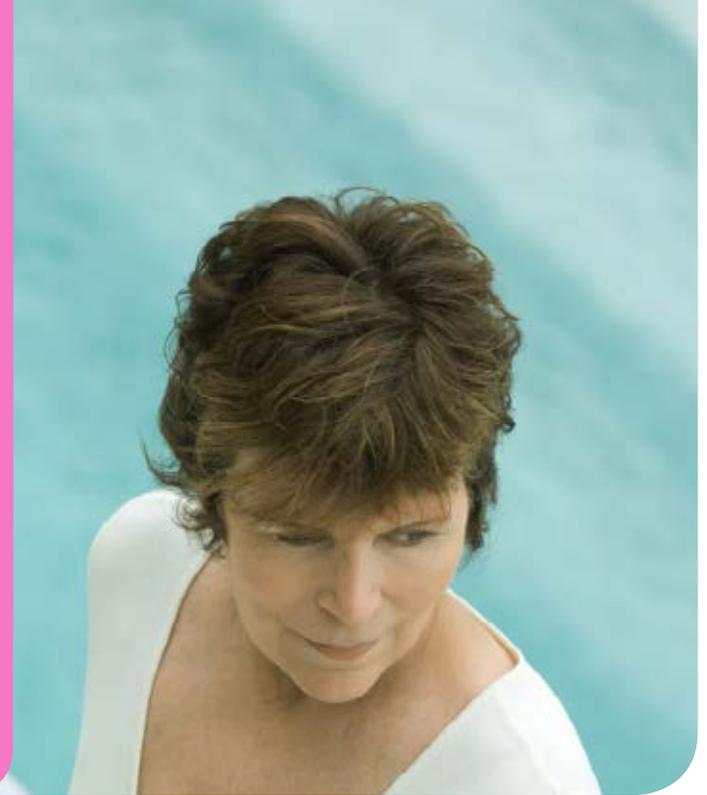


# Chemotherapy and HER2 inhibitors



# 3 Chemotherapy and HER2 inhibitors

22	Neoadjuvant chemotherapy
23	Should I have neoadjuvant chemotherapy?
24	Chemotherapy regimens
28	Receiving chemotherapy
29	Side effects of chemotherapy and HER2 inhibitors
30	Review



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Many stage III breast cancers are first treated with chemotherapy with or without HER2 inhibitors. The treatment goal is to kill off as many cancer cells as possible before surgery.

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Cancer drugs given for this purpose are called neoadjuvant (or preoperative) treatment. Part 3 discusses which cancer drugs are used for neoadjuvant treatment and the deciding factors of who should have neoadjuvant treatment.

## Neoadjuvant chemotherapy

### Chemotherapy before surgery

Chemotherapy is the class of drugs most often used for neoadjuvant treatment. Some chemotherapy drugs kill cancer cells by damaging their DNA (deoxyribonucleic acid) or disrupting the making of DNA. Other drugs interfere with cell parts that are needed for making new cells. Of importance, you should not have chemotherapy if you are in the first three months of pregnancy.

Many chemotherapy drugs work when cells are in an active growth phase. During the active growth phase, cells grow and divide to form a new cell. Chemotherapy drugs that disrupt the growth phase work well for cancer cells that are growing and dividing quickly. Other chemotherapy drugs work whether cells are in a growth or resting phase. Chemotherapy can kill both cancer and normal cells.

HER2 inhibitors used for stage III breast cancer include trastuzumab (Herceptin®) and pertuzumab (Perjeta®). HER2 inhibitors are taken with chemotherapy if the cancer is HER2 positive. They are a type of targeted therapy.

Targeted therapy stops the action of molecules that start the growth of cancer cells. Trastuzumab works by attaching to HER2 receptors—like a key into a lock—to stop the start of cell growth. Pertuzumab works like trastuzumab but attaches to a different part of the receptor. These two drugs also attract immune cells that help to kill the cancer cells.

Instead of chemotherapy, hormone therapy alone is an option for hormone receptor–positive cancer. Hormone therapy is discussed in Part 6. If your neoadjuvant treatment is hormone therapy, you may have chemotherapy after surgery.

## Should I have neoadjuvant chemotherapy?

### Deciding factors

Clinical stage IIIA (T3, N1, M0) cancers may be first treated with neoadjuvant chemotherapy or surgery.

If surgery is done first, surgery that removes the entire breast, called a mastectomy, is needed.

Chemotherapy is given after the mastectomy to lower the chances of breast cancer returning outside the breast. However, if you want to try to keep as much of your breast as possible, you need to have neoadjuvant chemotherapy first. If chemotherapy shrinks the tumor enough, you may have breast-conserving therapy. Read Part 4 for more information on breast-conserving therapy.

All other clinical stage III cancers can't be first treated with surgery because the cancer has grown and spread too much. Instead, neoadjuvant treatment is given. Neoadjuvant treatment may kill enough cancer cells so that surgery can be done.

### Should I have neoadjuvant chemotherapy?

No, if any of these factors describe you

- Have clinical stage IIIA (T3, N1, M0) cancer and don't want breast-conserving therapy, OR
- Have clinical stage IIIA (T3, N1, M0) cancer and can't have breast-conserving therapy.

Yes, if any of these factors describe you

- Have clinical stage IIIA (T3, N1, M0) cancer, are able to have breast-conserving therapy, and want it,
- Have any of these clinical stage IIIA cancers:
  - T0, N2, M0,
  - T1, N2, M0,
  - T2, N2, M0, or
  - T3, N2, M0,
- Have clinical stage IIIB cancer, OR
- Have clinical stage IIIC cancer.

## Chemotherapy regimens

### Recommended drugs

Chemotherapy drugs differ in the way they work, so often more than one drug is used. A combination regimen is the use of two or more chemotherapy drugs. Chemotherapy is given in cycles of treatment days followed by days of rest. The cycles vary in length depending on which drugs are used. Giving chemotherapy in cycles gives your body a chance to recover after receiving chemotherapy.

The recommended regimens for HER2-negative and HER2-positive tumors are listed below and on the following pages. They are divided by “preferred” and “other” regimens by NCCN experts based on how well they work, side effects, and treatment schedules.

### Preferred chemotherapy regimens | HER2-negative tumors

Preferred Regimen	Schedule	Total time
Dose-dense AC	Four 14-day cycles	4 months
then paclitaxel	Four 14-day cycles	
Dose-dense AC	Four 14-day cycles	5 months
then paclitaxel	Twelve 7-day cycles	
TC	Four 21-day cycles	3 months

#### Abbreviations

AC = doxorubicin + cyclophosphamide

TC = docetaxel + cyclophosphamide

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## Other chemotherapy regimens | HER2-negative tumors

Other Regimen	Schedule	Total time
Dose-dense AC	Four 21-day cycles	3 months
FAC or CAF	Six 21-day cycles Six 28-day cycles	4 months and 2 weeks 6 months
CEF or FEC	Six 28-day cycles Six 28-day cycles	6 months 6 months
CMF	Six 28-day cycles	6 months
AC then docetaxel	Four 21-day cycles Four 21-day cycles	6 months
AC then paclitaxel	Four 21-day cycles Twelve 7-day cycles	6 months
EC	Eight 21-day cycles	6 months
FAC then paclitaxel	Six 21-day cycles Twelve 7-day cycles	7 months and 2 weeks
FEC or CEF then paclitaxel	Four 21-day cycles Eight 7-day cycles	5 months 5 months
FEC or CEF then docetaxel	Three 21-day cycles Three 21-day cycles	4 months and 2 weeks
TAC	Six 21-day cycles	4 months and 2 weeks

**Abbreviations**

AC = doxorubicin + cyclophosphamide

CAF = cyclophosphamide + doxorubicin + fluorouracil

CEF = cyclophosphamide + epirubicin + fluorouracil

CMF = cyclophosphamide + methotrexate + fluorouracil

EC = epirubicin + cyclophosphamide

FAC = fluorouracil + doxorubicin + cyclophosphamide

FEC = fluorouracil + epirubicin + cyclophosphamide

TAC = docetaxel + doxorubicin + cyclophosphamide

TC = docetaxel + cyclophosphamide

## Preferred chemotherapy regimens | HER2-positive tumors

Preferred Regimen	Schedule	Total time
AC	Four 21-day cycles	1 year and 3 months
then paclitaxel	Twelve 7-day cycles	
with trastuzumab	Weekly during paclitaxel then every 7 or 21 days to complete 1 year	
AC	Four 21-day cycles	1 year and 3 months
then paclitaxel	Four 21-day cycles	
with pertuzumab	Weekly during paclitaxel	
and trastuzumab	Weekly during paclitaxel then every 21 days to complete 1 year	
Dose-dense AC	Four 14-day cycles	1 year and 2 months
then paclitaxel	Four 14-day cycles	
with trastuzumab	Weekly during paclitaxel then every 7 to 21 days to complete 1 year	
TCH	Six 21-day cycles with weekly trastuzumab, then trastuzumab every 21 days to complete 1 year	1 year
TCH + pertuzumab	Six 21-day cycles with weekly trastuzumab and pertuzumab then trastuzumab every 21 days to complete 1 year	1 year

**Abbreviations**

AC = doxorubicin + cyclophosphamide

FEC = fluorouracil + epirubicin + cyclophosphamide

TCH = docetaxel + carboplatin + trastuzumab

## Other chemotherapy regimens | HER2-positive tumors

Other Regimen	Schedule	Total time
AC	Four 21-day cycles	1 year and 3 months
then docetaxel	Four 21-day cycles	
with trastuzumab	Weekly during docetaxel cycles then every 21 days to complete 1 year	
AC	Four 21-day cycles	1 year and 3 months
then docetaxel	Four 21-day cycles	
with pertuzumab	On day 1 during docetaxel cycles	
and trastuzumab	On day 1 during docetaxel cycles then every 21 days to complete 1 year	
FEC	Three 21-day cycles	1 year and 9 weeks
then docetaxel	Three 21-day cycles	
with pertuzumab	On day 1 during docetaxel cycles	
and trastuzumab	On day 1 during docetaxel cycles then every 21 days to complete 1 year	
FEC	Three 21-day cycles	1 year and 9 weeks
then paclitaxel	Three 21-day cycles	
with pertuzumab	On day 1 during docetaxel cycles	
and trastuzumab	On day 1 during docetaxel cycles then every 21 days to complete 1 year	
Neoadjuvant docetaxel	Four 21-day cycles	3 months
with trastuzumab and pertuzumab	On day 1 during docetaxel cycles	
Adjuvant FEC	Three 21-day cycles	1 year and 9 weeks
then trastuzumab	Every 21 days to complete 1 year	
Neoadjuvant paclitaxel	Four 21-day cycles	3 months
with trastuzumab and pertuzumab	On day 1 during docetaxel cycles	
Adjuvant FEC	Three 21-day cycles	1 year and 9 weeks
then trastuzumab	Every 21 days to complete 1 year	

**Abbreviations:** AC = doxorubicin + cyclophosphamide; FEC = fluorouracil + epirubicin + cyclophosphamide; TCH = docetaxel + carboplatin + trastuzumab

## Receiving chemotherapy

### What to know

Neoadjuvant treatment can cause tumors to shrink a lot. Thus, your doctors may want you to have some procedures before treatment while the cancer can be found. These procedures may include:

#### Breast biopsy

You may receive a core needle biopsy of the breast tumor if not done before. This biopsy can confirm the tumor is cancer and what type. A needle will be inserted through your breast skin and into the tumor to remove a tissue sample. Your doctor will numb the area beforehand and may use an imaging test to help place the needle. When mammography is used to guide the needle, it is called a stereotactic needle biopsy. Ultrasound-guided biopsy uses an ultrasound image.

#### Axillary ultrasound

If you have clinical stage IIIA (T3, N1, M0) breast cancer, an ultrasound of the axillary lymph nodes is recommended if the physical exam was normal. An ultrasound is described on page 13.

#### Lymph node biopsy

Lymph node biopsies are described in Part 2. If you have clinical stage IIIA (T3, N1, M0) breast cancer, a lymph node biopsy is recommended if either the physical exam or ultrasound suggests cancer is present in axillary nodes.

#### Sentinel lymph node dissection

If the cancer has spread through lymph, it is likely to be found in your sentinel lymph node(s). A sentinel node is the first lymph node to which lymph travels after leaving the breast. Sometimes, there is more than one sentinel node.

A sentinel lymph node dissection may be done if you have clinical stage IIIA (T3, N1, M0). This procedure is also called a sentinel lymph node biopsy. It is recommended if no cancer was found in the lymph node biopsy. A sentinel dissection is more likely to find cancer, if present, than a lymph node biopsy.

For this dissection, radioactive or colored dye is injected into your breast. The dye follows the path the lymph takes when it leaves your breast. This allows your surgeon to find the sentinel node(s). After the dye marks your sentinel node(s), your surgeon will remove them and sometimes other nearby nodes as well. These nodes will then be sent to a pathologist for testing.

#### Tumor clips

You may have small metal clips placed in your breast near the tumor before neoadjuvant treatment. Lymph nodes with possible cancer should also be marked. Imaging tests, such as mammography or ultrasound, should be used to help place the clips. The clips will help your surgeon to find the tumor area and remove tissue after neoadjuvant treatment. The clips will be removed at the time of surgery.

### Chemotherapy

Before starting chemotherapy, your doctor may ask you to stop taking some of your medicines, vitamins, or both. Some of these treatments can cause chemotherapy to not work as well or may cause health problems while on chemotherapy. You may also have to change what you drink and eat. If you smoke, it's important that you stop.

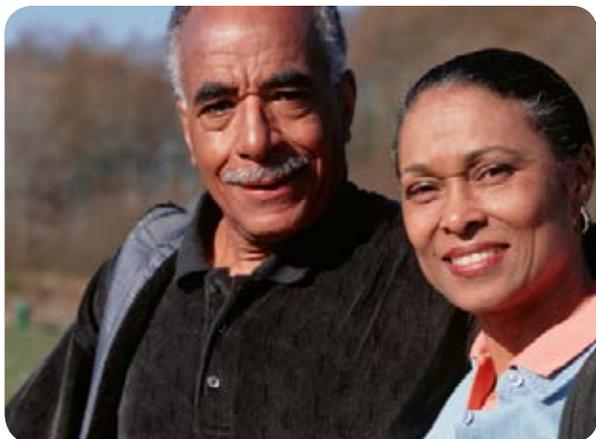
All chemotherapy drugs for stage III breast cancers are liquids that are injected into a vein. Only cyclophosphamide is made in pill form, too. The injection may be one fast shot of drugs into a vein or may be a slow drip called an infusion. Chemotherapy can also be given through a needle surgically placed

in the chest or the arm. Trastuzumab and pertuzumab are given by infusion.

You will need to go to a chemotherapy center to receive the drugs. How long your visit will be depends on what drugs you will get. It can take a few minutes or a few hours to finish a dose of chemotherapy. It takes about 90 minutes to get the first dose of trastuzumab and about 30 minutes for later doses. For pertuzumab, it takes about 60 minutes to get the first dose and about 30 to 60 minutes for later doses.

During chemotherapy cycles, you may be given other drugs to help you feel your best. You may be given drugs to fight nausea and vomiting. You may also receive filgrastim to increase the number of white blood cells to normal levels. Blood, heart, and other tests may be given to check your health.

If you have HER2-positive breast cancer, you should be treated with chemotherapy and HER2 inhibitors for at least 9 weeks before surgery. However, it is ideal that the full dose of chemotherapy be given before surgery. During chemotherapy you will be given tests to assess if the cancer is shrinking. Such tests include a physical exam and possibly imaging tests. If the cancer doesn't respond to the regimen, you may be given another regimen or radiation therapy. Radiation therapy is discussed in Part 5.



## Side effects of chemotherapy and HER2 inhibitors

### Unhealthy and unpleasant outcomes

The reactions to chemotherapy and HER2 inhibitors differ among women. Some women have many side effects. Other women have few. Some side effects can be very serious while others can be unpleasant but not serious.

### Chemotherapy

Side effects of chemotherapy depend on the drug type, amount taken, length of treatment, and the person. In general, side effects are caused by the death of fast-growing cells. These cells are found in the hair follicle, gut, mouth, and blood. Thus, common side effects of chemotherapy include low blood cell counts, not feeling hungry, nausea, vomiting, diarrhea, hair loss, and mouth sores. Other side effects may include anxiety, fatigue, and peripheral neuropathy. Peripheral neuropathy is numbness or tingling of nerves in the hands and feet.

Premenopausal women may start menopause early because of the chemotherapy drugs. Even if menstrual periods return after chemotherapy, you may still be unable to have babies. However, don't depend on chemotherapy for birth control. You may become pregnant while on chemotherapy, which can cause birth defects. If you had menstrual periods before chemotherapy, use birth control but not birth control made of hormones, such as "the pill." Talk to your doctors for more information.

### HER2 inhibitors

Allergic reactions are common with the first or second dose of trastuzumab. You may need to take medicine for allergies. You may also have a mild flu-like response to the first dose of trastuzumab that includes fever, chills, headache, muscle aches, and nausea. This response is less common with

the second and third doses. Other side effects may include damage to the heart and rarely to the lungs.

Common side effects of pertuzumab are diarrhea, nausea, and feeling tired and weak. Less common side effects include skin rash, low white blood cell counts, mouth sores, and hair loss. It is not yet clear if pertuzumab damages the heart, although similar drugs do.

Not all the side effects of chemotherapy and HER2 inhibitors are listed here. Please ask your treatment team for a complete list. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

## Review

- Neoadjuvant chemotherapy is chemotherapy given before surgery.
- Doctors use many factors to decide if you should have neoadjuvant chemotherapy.
- HER2-positive cancers should receive a HER2 inhibitor if undergoing neoadjuvant chemotherapy.
- Chemotherapy is often given by infusion.
- Chemotherapy and HER2 inhibitors can cause side effects. Ask your treatment team for a complete list.

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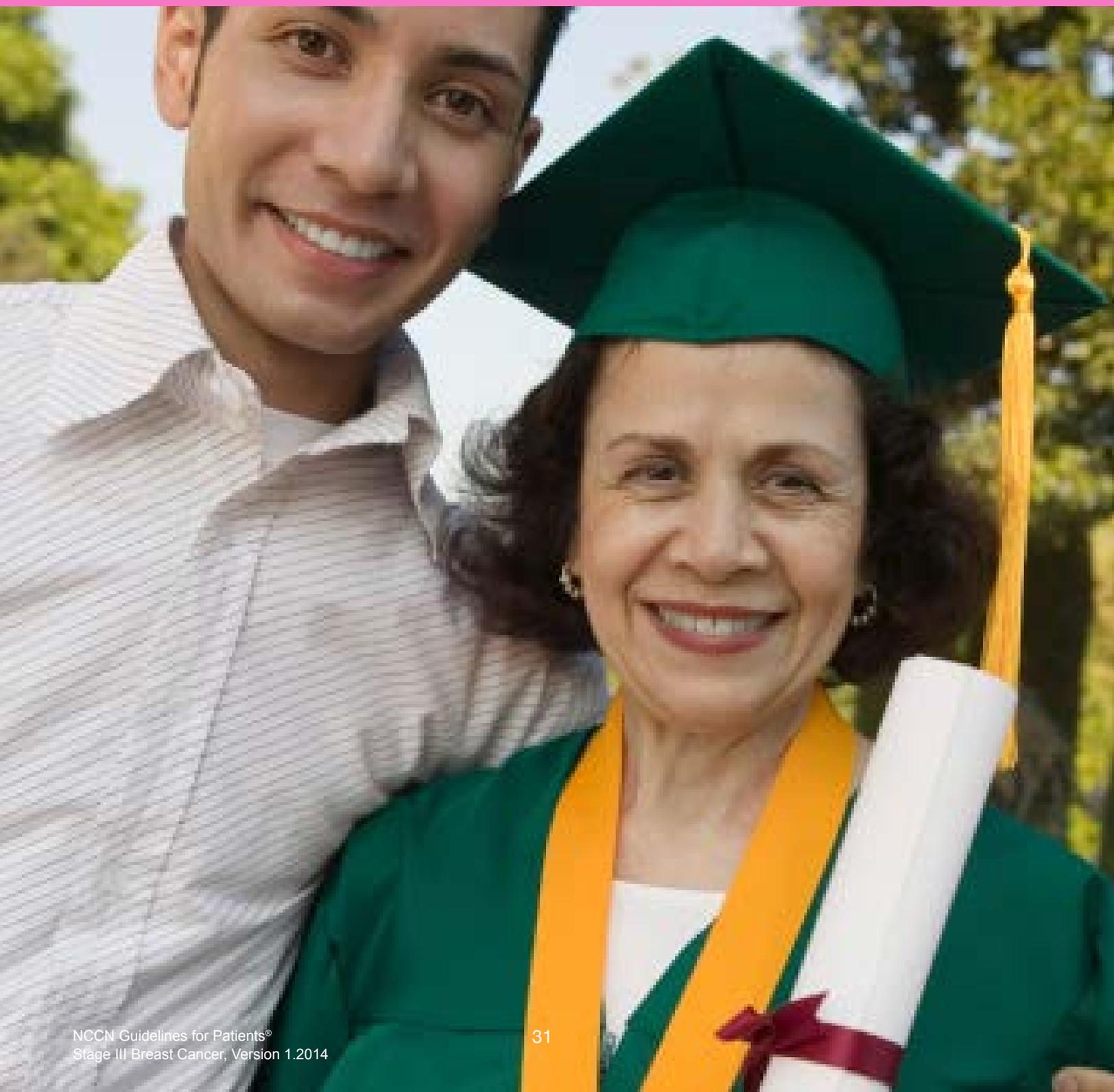
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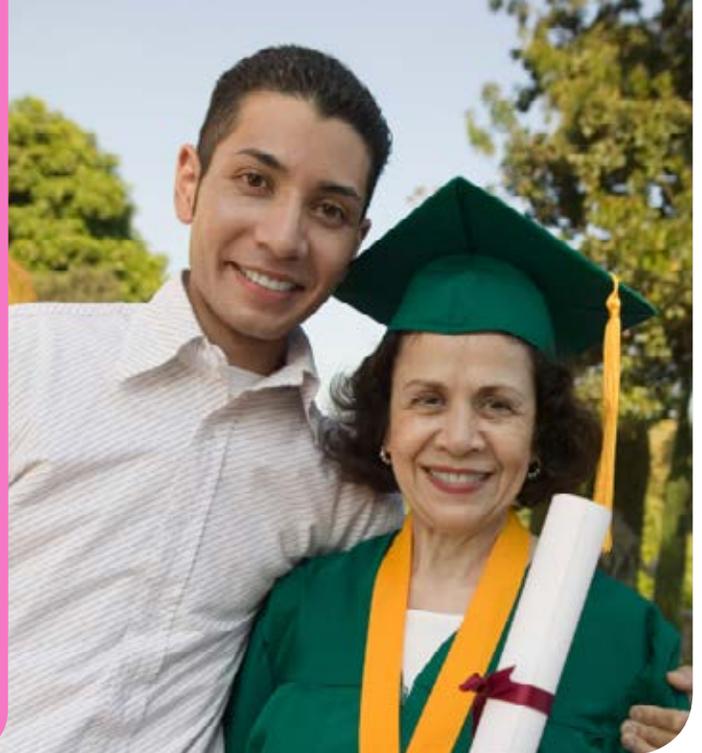
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# Breast surgery and Reconstruction



# 4 Breast surgery and reconstruction

32	Surgeries of breast tumors
34	Which breast surgery can I have?
35	Axillary lymph node dissection
35	Should I have an axillary dissection?
36	Side effects of cancer surgery
36	Breast reconstruction
38	Review



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Local treatments target cancer in one area of the body. Surgery is a local treatment for breast cancer. Part 4 describes the types of surgery used to remove stage III breast cancers and the deciding factors used to plan who can have which surgery. The recommendations for breast reconstruction are also presented.

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## Surgeries of breast tumors

### Removing breast tumors

There are two types of surgery used to remove breast tumors. 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 to get the best treatment results.

### Breast-conserving therapy

A lumpectomy is a surgery that removes the breast tumor and some normal tissue around the edge of the tumor. This normal tissue is called the surgical margin. When local treatment is a lumpectomy followed by radiation therapy, it is called breast-conserving therapy.

Before the lumpectomy, you will be given local or general anesthesia. As shown in **Figure 6**, the tumor is often removed through a C-shaped cut into the breast. This cut allows the breast to heal faster. A lumpectomy is usually finished within 15 to 40 minutes. Afterward, a tube may be placed in your breast to drain fluid.

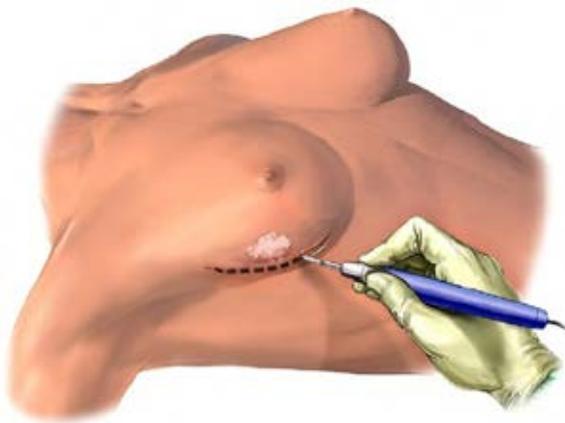
The tissue from the lumpectomy will be tested by a pathologist for cancer cells. It will also be tested to see if cancer cells extend to the edge of the surgical margin. You also may be given another mammography to look for any cancer that wasn't removed. If it appears that cancer remains in your breast, more surgery is needed.

### Total mastectomy

A mastectomy removes either a large part of or the whole breast. For stage III breast cancer, a total (also

called simple) mastectomy is recommended. This surgery removes the whole breast but doesn't remove the chest muscles under the breast.

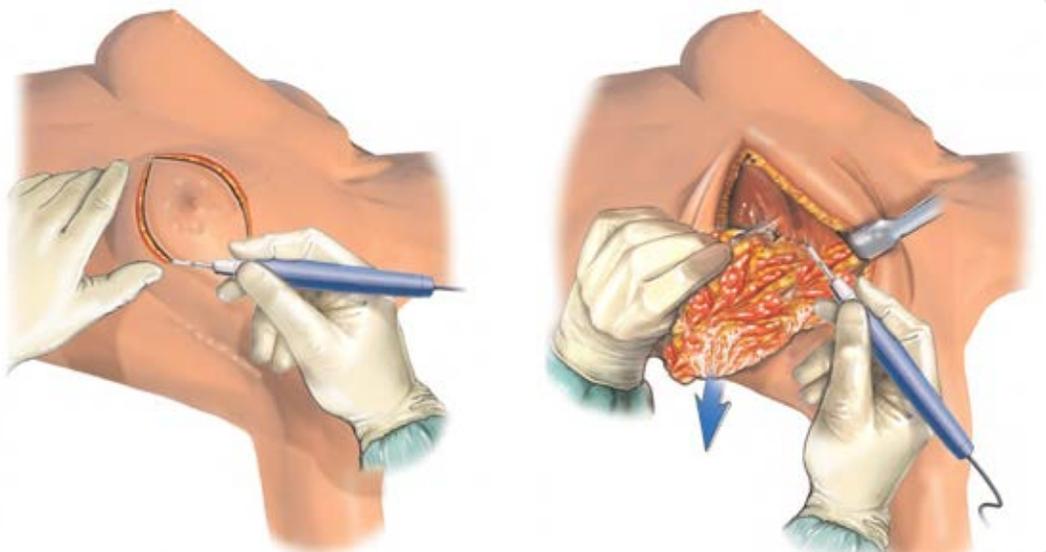
A total mastectomy is done under general anesthesia. Often, a surgeon makes an oval-shaped cut around the nipple as shown in [Figure 7](#). Next, the breast tissue is detached from the skin and muscle so it can be removed. A total mastectomy is finished within 1 to 2 hours. Afterward, a tube may be placed in your chest to drain fluid.



**Figure 6. Lumpectomy**

For a lumpectomy, a surgeon makes a C-shaped cut into the breast through which the tissue is removed. This cut allows the tissue to heal faster.

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**Figure 7. Total mastectomy**

For a mastectomy, a surgeon makes an oval-shaped cut around the nipple. Next, the breast tissue is detached from the skin and muscle so it can be removed.

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## Which breast surgery can I have?

### Deciding factors

If you had neoadjuvant treatment, your doctors will assess how well the cancer responded. Depending on the treatment results and other factors, breast-conserving therapy may be used to fully remove the cancer in your breast. Breast-conserving therapy is more often used for T3, N1, M0 cancer than other stage III cancers.

A total mastectomy is always an option for T3, N1, M0 cancer whether you had neoadjuvant treatment or not. If you didn't have neoadjuvant chemotherapy, chemotherapy is given after surgery. Read page 24 for recommended chemotherapy regimens.

A total mastectomy is an option for other stage III breast cancers that responded to neoadjuvant treatment. If the cancer didn't respond, your doctors will create a treatment plan based on the features of the cancer and other factors. If you had a lumpectomy, a total mastectomy is recommended if cancer is found in many areas of the surgical margin.

### Which breast surgery can I have?

Breast-conserving therapy, if all of these factors describe you

- Had neoadjuvant treatment and the tumor shrank enough,
- Haven't had radiation close to where the cancer is,
- Can have all cancer removed through one cut,
- Your breast won't be too disfigured afterward,
- Aren't genetically predisposed to breast cancer, AND
- Have no connective tissue disease that affects your skin.

Mastectomy, if any of these factors describe you

- Have clinical stage IIIA (T3, N1, M0) cancer that was or was not treated with neoadjuvant treatment,
- Have another clinical stage III cancer that shrunk during neoadjuvant treatment, OR
- Have had a lumpectomy with many areas of cancer in the surgical margin.

## Axillary lymph node dissection

### Removing lymph nodes near your armpit

Most of the lymph in the breast drains to the axillary lymph nodes. Thus, breast cancer is most likely to first spread to the axillary nodes. An axillary lymph node dissection removes many axillary lymph nodes and is done at the same time as the breast surgery. At least 10 lymph nodes are removed from Level I and II areas. Level I lymph nodes lie below the armpit. Level II nodes are in the armpit. If cancer is found in Level II lymph nodes, nodes from Level III will be removed. Level III nodes are below the collarbone.

## Should I have an axillary dissection?

### Deciding factors

In Part 2, a sentinel lymph node dissection was recommended before neoadjuvant chemotherapy if the cancer is clinical stage IIIA (T3, N1, M0). If no cancer is found, no other surgery is needed and the cancer will be re-staged to stage II. An axillary dissection is recommended if cancer in the axillary nodes is found by sentinel dissection or a lymph node biopsy. For all other stage III cancers, axillary lymph node dissection is recommended.

### Should I have an axillary dissection?

No, if you

- Have clinical stage IIIA (T3, N1, M0) cancer and no cancer was found by the sentinel lymph node dissection.

Yes, if any of these factors describe you

- Have clinical stage IIIA (T3, N1, M0) cancer and the lymph node biopsy or sentinel lymph node dissection found cancer,
- Have any of these clinical stage IIIA cancers:
  - T0, N2, M0,
  - T1, N2, M0,
  - T2, N2, M0, or
  - T3, N2, M0,
- Have clinical stage IIIB cancer, OR
- Have clinical stage IIIC cancer.

## Side effects of cancer surgery

### Unhealthy and unpleasant outcomes

Side effects are unhealthy or unpleasant physical or emotional responses to treatment. Common side effects of any surgery are pain, swelling, and scars. Pain and swelling often fade away in the weeks following surgery.

After breast surgery, you may also have a loss of feeling where you had the surgery. A total mastectomy may also cause stiffness, severe tiredness despite sleep, and uncomfortable crawly sensations as your nerves heal. If you receive general anesthesia, it may cause a sore throat, nausea with vomiting, confusion, muscle aches, and itching.

Side effects are more common and severe with axillary lymph node dissection than sentinel lymph node dissection. Lymphedema is the most serious of these side effects and may be permanent. Lymphedema is swelling due to buildup of lymph. It occurs in the arms after node removal. Most women find lymphedema bothersome but not disabling. There is no way to know who will have it or when it will occur. It can happen just after surgery or months to years later.

Not all the side effects of surgery are listed here. Please ask your treatment team for a complete list. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

## Breast reconstruction

### Methods to rebuild breasts

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. Other women use external fake breasts or do nothing. The NCCN recommendations for breast reconstruction are presented next. Talk with your doctor about these options. For more information on breast reconstruction, visit the websites listed in Part 9.

### 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. If you choose to have volume displacement, a larger piece of breast tissue will be removed, but this likely will reduce your chances of cancer returning in that breast. Another benefit is that the natural look of your breast will be 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 surgeons and plastic surgeons need to work well together.

### Timing of reconstruction

You can have reconstruction at any time. 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. All involve having plastic surgery. Breast reconstruction is generally safe, but with any surgery there are risks. Please ask your treatment team for a complete list of the risks. 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 skin and muscle. 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. In addition, some women will 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 then sewn in place. Other flaps stay attached and then are slid over to the breast area and 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. To rebuild a nipple, tissue from your vulva, thigh, or other nipple is used. 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.



# Radiation therapy



# 5 Radiation therapy

- 40 External radiation therapy
- 42 Where do I need radiation therapy?
- 44 Side effects of radiation
- 44 Review



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Radiation therapy is a local treatment that uses high-energy rays to treat cancer. The rays damage the genes in cells. The damage either kills the cancer cells or stops new cancer cells from being made. Part 5 discusses how radiation therapy is given and to which areas.

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## External radiation therapy

### The most common method

Radiation therapy is given after chemotherapy is finished. It is okay to take trastuzumab during radiation therapy. If you didn't have chemotherapy, radiation therapy follows surgery. If you are pregnant, you may have radiation after your baby is born.

The most common type of radiation therapy used for breast cancer is EBRT (external beam radiation therapy). This type of therapy uses a machine outside the body to deliver radiation. Radiation beams are aimed at the tumor with help from ink marks or tiny tattoos on the skin.

Before EBRT, pictures (images) of the breast region should be taken with a CT scan. See page 13 for information on CT scans. Imaging the region and designing the radiation treatment before EBRT is called simulation. 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 will be 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. 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,
- Using 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.

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You will be alone while a technician operates the EBRT machine from a nearby room. An EBRT machine is shown in **Figure 8**. The technician 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 often given 5 days a week for 5 to 7 weeks but may be done quicker for some women.

**Figure 8. EBRT machine**

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



Clinac 2100 C by Zubro available at commons.  
[wikimedia.org/wiki/File:Clinac\\_2100\\_C.JPG](https://commons.wikimedia.org/wiki/File:Clinac_2100_C.JPG) released  
 under GFDL and CC-BY-SA.



## Where do I need radiation therapy?

### Deciding factors

Using the surgery results, your doctors will rate the extent of the cancer again. This is called the pathologic stage. Recommendations for radiation therapy are based on the pathologic stage. The three subgroups of pathologic stage III are:

**Stage IIIA.** These breast tumors are larger than 5 centimeters but don't involve the breast skin or chest wall. Cancer has been found in 1 to 3 axillary lymph nodes, in internal mammary nodes by sentinel lymph node dissection, or both. The TNM scores for these tumors are T3, N1, M0.

Other stage IIIA breast tumors are of any size or not found. These breast tumors don't involve the breast skin or chest wall. Cancer has been found in 4 to 9

axillary nodes or in the internal mammary nodes by imaging tests or physical exam. The TNM scores for these tumors are T0, N2, M0; T1, N2, M0; T2, N2, M0; or T3, N2, M0.

**Stage IIIB.** These breast tumors involve the breast skin, chest wall, or both. If in the skin, the skin has open sore(s), small secondary tumor(s), or is swollen. Cancer has been found in none of the lymph nodes, in 1 to 9 axillary nodes, or in internal mammary nodes. The TNM scores for these tumors are T4, N0, M0; T4, N1, M0; or T4, N2, M0.

**Stage IIIC.** A breast tumor may or may not have been found. However, cancer has been found in 10 or more axillary lymph nodes, in axillary and internal mammary nodes, in infraclavicular nodes, or in supraclavicular nodes. The TNM scores for these tumors are Any T (T0 – T4), N3, M0.

### Radiation therapy after lumpectomy

Pathologic Stage	Where do I need radiation?
Stage IIIA (T3, N1, M0)	<ul style="list-style-type: none"> <li>• Whole breast with or without boost, and</li> <li>• Strongly consider treating internal mammary, infraclavicular, and supraclavicular lymph nodes.</li> </ul>
All other stage III cancers	<ul style="list-style-type: none"> <li>• Chest wall,</li> <li>• Infraclavicular and supraclavicular lymph nodes, and</li> <li>• Internal mammary lymph nodes if cancer is present or strongly consider treating if no cancer is present.</li> </ul>

After a lumpectomy, your whole breast will be treated with radiation. This is called whole breast radiation. If the cancer is stage IIIA (T3, N1, M0), strongly consider radiation therapy of your internal mammary, infraclavicular, and supraclavicular lymph nodes.

For all other stage III cancers, radiation therapy of your infraclavicular and supraclavicular nodes is recommended and radiation of internal mammary nodes should be strongly considered.

Toward the end of radiation, you may receive extra radiation to the tumor site called a boost. 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. After the seeds are removed, you can leave the hospital. However, radiation is given twice a day for 5 days.



### Radiation therapy after mastectomy

Pathologic Stage	Where do I need radiation?
Stage IIIA (T3, N1, M0)	<ul style="list-style-type: none"> <li>• Strongly consider treating the chest wall and infraclavicular and supraclavicular lymph nodes, and</li> <li>• If radiation is given, strongly consider treating the internal mammary nodes.</li> </ul>
All other stage III cancers	<ul style="list-style-type: none"> <li>• Chest wall,</li> <li>• Infraclavicular and supraclavicular lymph nodes, and</li> <li>• Internal mammary lymph nodes if cancer is present or strongly consider treating if no cancer is present.</li> </ul>

If the cancer is stage IIIA (T3, N1, M0), radiation therapy to your chest wall and internal mammary, infraclavicular, and supraclavicular lymph nodes should be strongly considered. For all other stage III cancers, radiation therapy to the chest wall and infraclavicular and supraclavicular nodes is

recommended. Radiation therapy should be given to the internal mammary lymph nodes if tests suggest cancer is present. However, even when test results show no cancer, your doctors may still want to treat this area.

## Side effects of radiation

You may have side effects from radiation although not everyone does. The most common side effect of radiation therapy is changes in your skin. Your treated skin will look and feel as if it has been sunburned. It will likely become red and also may become dry, sore, and be painful when touched. 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.

Not all the side effects of radiation have been listed here. Please ask your treatment team for a complete list of side effects. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

## Review

- External radiation is most often used for breast cancer.
- Doctors mainly use the pathologic stage to decide who should have radiation therapy.
- The most common side effect of radiation therapy is changes in your skin.

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# Hormone therapy



# 6 Hormone therapy

48	Types of hormone therapy
50	Hormone therapy regimens
52	Side effects of hormone therapy
52	Review



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If the breast cancer is hormone receptor–positive, hormone therapy will be part of your treatment. It stops the growth of cancer cells that is caused by hormones. Hormone therapy may be started during or after radiation therapy. If you are pregnant, you may receive hormone therapy after your baby is born. Part 6 presents the recommendations for who should take which types of hormone therapy.

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## Types of hormone therapy

### 4 main groups

Estrogen and progesterone are hormones that cause some breast cancer cells to make more cancer cells. Estrogen is mostly made by the ovaries and made in small amounts by the adrenal glands, liver, and body fat. Progesterone is also mostly made by the ovaries. Blocking these hormones from working or lowering hormone levels can help stop breast cancer from growing. There are many types of hormone therapy used to treat early breast cancer.

### Antiestrogens

Antiestrogens are drugs that stop the effect of estrogen on cancer cell growth. Tamoxifen is an antiestrogen used for stage III breast cancer. Tamoxifen treats breast cancer by attaching to the estrogen receptors and blocking estrogen from attaching. It is a pill that is taken every day during the course of treatment.

### Aromatase inhibitors

Aromatase inhibitors are drugs that lower estrogen levels in the body. These drugs work by blocking a protein that makes estrogen in postmenopausal women. They can't stop the ovaries in premenopausal women from making estrogen. For this reason, these drugs are only used among postmenopausal women. Three drugs in this category are: anastrozole, letrozole, and exemestane. Each are a pill that is taken every day during the course of treatment.

### Ovarian ablation

The ovaries are the main source of estrogen and progesterone in premenopausal women. Removing them stops most estrogen from being made. Surgery that removes both ovaries is called a bilateral

oophorectomy. Radiation therapy to the ovaries also stops the ovaries from making estrogen and progesterone, but isn't used often. Both treatments are forms of ovarian ablation.

### Ovarian suppression

Ovarian suppression is when drugs are used to tell the ovaries to make less estrogen. Ovarian suppression is achieved with drugs called LHRH (luteinizing hormone-releasing hormone) agonists. LHRH is a hormone made in the brain that helps to regulate estrogen production in the ovaries. LHRH agonists stop LHRH from being made, which stops the ovaries from making more estrogen. Goserelin acetate and leuprolide are LHRH agonists and should be given as monthly injections under the skin.

## Hormone therapy drugs for stage III breast cancer

Generic name	Brand name	Type of hormone therapy
Anastrozole	Arimidex®	Aromatase inhibitor
Exemestane	Aromasin®	Aromatase inhibitor
Goserelin acetate	Zoladex®	Ovarian suppressor
Letrozole	Femara®	Aromatase inhibitor
Leuprolide acetate	Eligard®, Lupron®	Ovarian suppressor
Tamoxifen citrate	–	Antiestrogen

## Hormone therapy regimens

### Recommended drugs

Which hormone therapy you should take is based on your menopausal status. Menopause is the point in time when you won't have another menstrual period again. If you haven't had a menstrual period in the past year, you are considered postmenopausal. Breast cancer doctors also define menopause as when the ovaries aren't able to make high levels of estrogen.

If you were having menstrual periods (premenopausal) before starting chemotherapy, the absence of menstrual periods after chemotherapy doesn't mean you're postmenopausal. Your ovaries may still be working despite no menstrual periods or may start working again. To confirm your menopausal status, the amount of estrogen or FSH (follicle-stimulating hormone) in your blood needs to be tested. If you are taking LHRH agonists, it isn't possible to know your menopausal status.

Hormone therapy drugs are usually taken for 5 to 10 years. The first hormone therapy taken is the initial treatment. Sometimes a second type of hormone therapy is taken within the 5-year period. This is called sequential treatment. Hormone therapy taken beyond the 5-year period is called extended treatment.

### Premenopausal women

If you still have menstrual periods, tamoxifen is recommended. Initial treatment with tamoxifen is for 5 years. Ovarian ablation or suppression may be added to tamoxifen. After 5 years of tamoxifen, your menstrual status will be assessed again. If you are still premenopausal, you may stop hormone therapy or consider taking tamoxifen for another 5 years. If you're postmenopausal, taking an aromatase inhibitor for up to 5 years is recommended or consider taking tamoxifen for another 5 years. The hormone therapy recommendations for premenopausal women are listed in the chart below.

### Hormone therapy recommendations | Premenopausal women

Initial treatment	Extended treatment
Tamoxifen for 5 years ± ovarian suppression or ablation	If still premenopausal: <ul style="list-style-type: none"> <li>• Consider taking tamoxifen for another 5 years, or</li> <li>• Stop taking hormone therapy</li> </ul>
	If postmenopausal: <ul style="list-style-type: none"> <li>• Take aromatase inhibitors for 5 years, or</li> <li>• Consider taking tamoxifen for another 5 years</li> </ul>

### Postmenopausal women

In the chart, eight options for hormone therapy are listed if you are postmenopausal. An aromatase inhibitor may be taken either as initial treatment or following tamoxifen as a sequential or extended treatment. In some cases, taking tamoxifen alone is an option.

The hormone therapy recommendations for postmenopausal women are listed in the chart below.

### Hormone therapy recommendations | Postmenopausal women

Initial, sequential, and extended treatment
Aromatase inhibitor for 5 years
Tamoxifen for 2–3 years followed by an aromatase inhibitor to complete 5 years of hormone therapy
Tamoxifen for 2–3 years followed by an aromatase inhibitor taken for up to 5 years
Aromatase inhibitor for 2–3 years followed by tamoxifen to complete 5 years of hormone therapy
Tamoxifen for 4.5–6 years followed by an aromatase inhibitor for up to 5 years
Consider tamoxifen for 9.5–11 years
Tamoxifen for 5 years if aromatase inhibitors aren't an option
Consider tamoxifen for 10 years if aromatase inhibitors aren't an option

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## Side effects of hormone therapy

### Unhealthy and unpleasant outcomes

For many women, hormone therapy causes symptoms of menopause. Menopausal symptoms include hot flashes, vaginal discharge or dryness, sleep problems, weight gain, hair thinning, fatigue, and changes in mood. Which symptoms you will have may differ from other women.

Tamoxifen also has two rare but more serious side effects: 1) cancer of the uterus; and 2) blood clots. For most women with breast cancer, the benefits of taking tamoxifen far outweigh the risks. Aromatase

inhibitors don't cause cancer and very rarely cause blood clots. However, they can weaken your bones (called osteoporosis) and cause bone fractures. Checking your bone health with regular bone mineral density tests can show bone weakness before fractures occur. Your doctor can order medicine to strengthen your bones if necessary.

Not all the side effects of hormone therapy are listed here. Please ask your treatment team for a list of all common and rare side effects. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

## Review

- Hormone therapy stops the growth of cancer cells that is caused by hormones.
- Hormone therapy is taken by women with hormone-positive breast cancer.
- There are 4 main groups of hormone therapy.
- Types of hormone therapy that should be taken are based on menopausal status.
- Hormone therapy causes symptoms of menopause.

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# Follow-up care



# 7 Follow-up care

52	Follow-up tests
53	Hormone therapy check-up
53	Healthy lifestyle
54	Review



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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. You may still be taking trastuzumab or hormone therapy when follow-up care starts.

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## Follow-up tests

### Assessing treatment outcomes

#### Medical history and physical exam

A medical history and physical exam are recommended every 4 to 6 months for 5 years. If test results are normal for 5 years, then you should 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. For more information about these tests, see page 10.

#### Mammography

Mammography is recommended every year. The use of breast MRI is an option if you have a high risk for cancer in the other breast. More information about these imaging tests can be found on page 12. If the breast cancer returns, read Part 8.

## Hormone therapy check-up

### Health care recommendations

#### Stay on hormone therapy

If you take hormone therapy, it is very important that you don't stop taking your medication. If you do, the cancer will be more likely to return. Tell your doctor about any side effects that make you think about quitting. There may be ways to get relief.

#### GYN (gynecologic) exam

If you take tamoxifen, a GYN exam is needed each year since this drug can increase your chances for cancer of the uterus. For this exam, your doctor will ask about any abnormal bleeding. If you have seen any vaginal bleeding that isn't normal for you, tell your doctor.

#### Bone mineral density

If you take an aromatase inhibitor, you should have your bone mineral density tested regularly. Your bone mineral density should also be tested if cancer treatments caused you to start menopause. Aromatase inhibitors and starting menopause early can cause bone loss. Bone mineral density tests show your doctors how strong your bones are. These tests use x-rays or sound waves.

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## Healthy lifestyle

### Get better treatment results

#### Physical activity

Starting or maintaining an active lifestyle is recommended. Physical activity has been linked to better treatment results. Ask your treatment team about ways for you to be more active.

#### Healthy body weight

Like physical activity, a healthy body weight has been linked to better treatment results. BMI (body mass index) is a measure of body fat based on height and weight. A BMI score of 20 to 25 is recommended in order to have the best overall health and breast cancer outcomes. Ask your treatment team about ways to achieve a healthy body weight.







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# Treatment for recurrence



# 8 Treatment for recurrence

56	Treatment planning
58	Treatment for local recurrence
59	Treatment for lymph node recurrence
60	Review



For some women, breast cancer returns after a disease-free period. Breast cancer may return in or near the breast, near to where the breast was removed, or in distant organs. If the breast cancer returns in distant sites, read the NCCN Guidelines for Patients®: Stage IV Breast Cancer. Part 8 discusses treatment for cancer that returns in a breast or near to where a breast is or was.

## Treatment planning

### Recommended tests

#### Test names and counseling

Medical history and physical exam
CBC and liver function tests
CT scan of the chest
CT or MRI scan of the abdomen ± pelvis
Brain MRI if symptoms
Bone scan or sodium fluoride PET/CT (positron emission tomography-computed tomography)
FDG PET/CT if needed
X-rays of bones if needed
Biopsy of recurrence
Hormone and HER2 receptor tests if status was unknown or negative before
Genetic counseling if needed



## Treatment for local recurrence

### Local recurrence

Prior treatment	Treatment for recurrence
Breast-conserving therapy	Total mastectomy + axillary dissection. Consider adjuvant treatment.
Mastectomy + radiation therapy	Surgery if possible. Consider adjuvant treatment.

Treatment for a local recurrence depends on your prior treatment. If you had breast-conserving therapy, a total mastectomy is recommended. You may also have an axillary lymph node dissection if not done before. If you had a mastectomy and radiation

therapy, the cancer should be removed by surgery if possible. For all recurrences, adjuvant treatment with chemotherapy, chemotherapy with trastuzumab, or hormone therapy may be given.

## Treatment for lymph node recurrence

### Lymph node recurrence

Lymph node site	Treatment for recurrence
Armpit (axillary)	If possible, surgery and radiation therapy to the chest wall, axilla, and infraclavicular and supraclavicular lymph nodes.
Above the collarbone (supraclavicular)	If possible, radiation therapy to the chest wall and infraclavicular and supraclavicular lymph nodes.
Just inside the ribs near the breast bone (internal mammary)	If possible, radiation therapy to the chest wall and internal mammary, infraclavicular, and supraclavicular lymph nodes.

The cancer may return to your lymph nodes with or without a local recurrence. If cancer is found in your axillary lymph nodes, surgery and radiation therapy is recommended. Radiation therapy should target your chest wall, the side of your body under the armpit (axilla), and infraclavicular and supraclavicular lymph nodes. When cancer is found in either your supraclavicular or internal mammary lymph nodes, radiation therapy without surgery is suggested.

For a supraclavicular recurrence, radiation should target your chest wall and infraclavicular and supraclavicular nodes. For an internal mammary recurrence, radiation should target your chest wall and internal mammary, infraclavicular, and supraclavicular nodes. For all recurrences, adjuvant treatment with chemotherapy, chemotherapy with trastuzumab, or hormone therapy may be given.

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# Making treatment decisions



# 9 Making treatment decisions

- 62 Have a treatment plan
- 63 Get a 2<sup>nd</sup> opinion
- 64 Questions to ask your doctor
- 66 Websites | Decision aids



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Having breast cancer can be very stressful. While absorbing the fact that you have cancer, you have to learn about tests and treatments and accept a treatment plan. Parts 2 through 8 gave the treatment recommendations of the NCCN breast cancer experts. Part 9 has other useful information on treatment planning.

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## Have a treatment plan

### A roadmap through cancer care

Learning that you have breast cancer 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 stage III breast cancer 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 care providers listed.
- Test results – Since breast cancers can greatly differ, test results that describe the cancer 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.



## Questions about **testing** to ask your doctor

### Ask your doctors questions:

1. What tests do you recommend?
2. Where will the tests take place? Will I have to go to the hospital?
3. How long will the tests take?
4. Will any test hurt?
5. What if I am pregnant?
6. How do I prepare for testing?
7. Should I bring a list of my medications?
8. Should I bring someone with me?
9. How soon will I know the results and who will explain them to me?
10. Can I have a copy of the test results including the pathology report?
11. Who will talk with me about the next steps? When?

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## Questions about **treatment** to ask your doctor

### Ask your doctors questions:

1. What treatments do you recommend?
2. What are the risks and benefits of each treatment?
3. How do my age, health, and other factors affect my choices?
4. Would you help me get a 2<sup>nd</sup> opinion?
5. What can I do to prepare for treatment?
6. How soon should I start treatment?
7. How much will the treatment cost? How can I find out how much my health insurance will cover?
8. How likely is it that I'll be cancer-free after treatment?
9. What symptoms of treatment should I look out for?
10. What are my chances that the cancer will return?
11. What are my options for breast reconstruction?

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# Glossary

Dictionary  
Acronyms

# Dictionary

**abdomen**

The belly area between the chest and pelvis.

**adjuvant treatment**

Treatment given after the main treatment used to cure disease.

**adrenal gland**

A small organ on top of each kidney that makes hormones.

**alkaline phosphatase (ALP)**

A protein found in most tissues of the body.

**allergic reaction**

Symptoms caused when the body is trying to rid itself of invaders.

**antiestrogen**

A drug that stops estrogen from attaching to cells.

**areola**

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

**aromatase inhibitor**

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

**axillary lymph nodes**

Lymph nodes that are under the armpit.

**axillary lymph node dissection**

Surgery to remove axillary lymph nodes.

**bilateral oophorectomy**

Surgical removal of both ovaries.

**biopsy**

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

**body mass index (BMI)**

A measure of body fat based on height and weight.

**bone mineral density**

A test that measures the strength of bones.

**bone scan**

A test that uses radioactive material to assess for bone damage.

**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. Also called internal radiation.

**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 staging**

The rating of the growth and spread of cancer.

**carcinoma**

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

**catheter**

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

**chest wall**

The layer of muscle, bone, and tissue on the outer part of the chest.

**clinical breast exam**

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

**clinical stage**

The rating of the extent of cancer based on tests before treatment.

**complete blood count (CBC)**

A test of the number of blood cells.

**computed tomography (CT)**

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

**contrast**

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

**core needle biopsy**

Use of a needle to remove a large tissue sample.

**deoxyribonucleic acid (DNA)**

A very thin and long molecule that contains genetic code. Also called the “blueprint of life.”

**diagnostic bilateral mammography**

A test that uses x-rays to make pictures of the insides of both breasts.

**duct**

A tube in the breast that drains breast milk.

**ductal carcinoma**

Cancers that started in ductal cells.

**estrogen**

A hormone that develops female body traits.

**external beam radiation therapy (EBRT)**

Treatment with radiation received from a machine outside the body.

**fertility specialist**

An expert who helps women to have babies.

**fine-needle aspiration (FNA)**

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

**flap**

Tissue taken from one area of the body and used in another area.

**follicle-stimulating hormone (FSH)**

A hormone made by the ovaries.

**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 breast cancer**

Breast cancer caused by abnormal coded information in cells that is passed from parent to child.

**hernia**

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

**hives**

Itchy, swollen, and red skin caused by the body ridding itself of an invader.

**hormone**

A chemical in the body that activates cells or organs.

**hormone receptor**

A protein in cell membranes 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.

**human epidermal growth factor receptor 2 (HER2)**

A protein on the edge of a cell that send signals for the cell to grow.

**human epidermal growth factor receptor 2 (HER2)-negative**

Cancer cells with normal numbers of HER2 receptors.

**human epidermal growth factor receptor 2 (HER2)-positive**

Cancer cells with too many HER2 receptors.

**imaging test**

A test that makes pictures of the insides of the body.

**immunohistochemistry (IHC)**

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

**infusion**

A method of giving drugs slowly through a needle into a vein.

**in situ hybridization (ISH)**

A lab test of that counts the number of copies of a gene.

**internal mammary**

The area along the breastbone.

**invasive breast cancer**

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

**liver function test**

A test that measures chemicals made or processed by the liver.

**lobular carcinoma**

Cancer that started in lobular cells.

**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.

**luteinizing hormone-releasing hormone (LHRH)**

A hormone made in the brain that helps regulate estrogen production by the ovaries.

**lymph**

A clear fluid containing white blood cells.

**lymphedema**

Swelling of the body due to a buildup of lymph.

**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.

**mastectomy**

Surgery to remove the whole breast.

**medical history**

All health events and medications taken to date.

**menopause**

The point in time when menstrual periods end.

**metaplastic carcinoma**

Cancer that changed from one cell type to another.

**mixed carcinoma**

Cancer that has more than one cell type.

**mucinous breast cancer**

Cancer that has a lot of mucus around the cells. Also called colloid breast cancer.

**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.

**neoadjuvant treatment**

Treatment given before the main treatment used to cure disease.

**nipple replacement**

The rebuilding of a breast nipple.

**osteoporosis**

A disease that causes thinning, weakened bones.

**ovarian ablation**

Methods used to stop the ovaries from making estrogen.

**ovarian suppression**

Methods used to lower the amount of estrogen made by the ovaries.

**partial breast irradiation**

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

**pathologic stage**

A rating of the extent of cancer based on tests given after treatment.

**pathologist**

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

**pelvic exam**

A review of the female organs in the pelvis.

**primary tumor**

The first mass of cancer cells in the body.

**pelvis**

The area between the hip bones.

**physical exam**

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

**positron emission tomography (PET)**

Use of radioactive material to see the shape and function of body parts.

**postmenopause**

The state of the end of menstrual periods.

**premenopause**

The state of having regular menstrual periods.

**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 radiation to treat cancer.

**radiologist**

A doctor who specializes in reading imaging tests.

**radiotracer**

A substance with radioactive material that is used to make pictures of body parts.

**receptor**

A protein within cells to which substances can attach.

**recurrence**

The return of cancer after a disease-free period.

**sentinel lymph node**

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

**sentinel lymph node dissection**

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

**side effect**

An unhealthy or unpleasant physical or emotional response to treatment.

**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 needle biopsy**

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

**stroma**

Supportive tissue in the breast.

**supraclavicular**

The area right above the collarbone.

**surgical margin**

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

**targeted therapy**

Drugs that stop the action of molecules that start the growth of cancer cells.

**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.

**tubular breast cancer**

Cancer that has cells that look like tubes.

**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.

**volume displacement**

The shifting of breast tissue.

**vulva**

The female organs between the legs.

**whole breast radiation**

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

# Acronyms

**BMI**

body mass index

**CBC**

complete blood count

**CT**

computed tomography

**DNA**

deoxyribonucleic acid

**EBRT**

external beam radiation therapy

**FNA**

fine-needle aspiration

**FSH**

follicle-stimulating hormone

**IHC**

immunohistochemistry

**IMRT**

intensity-modulated radiation therapy

**ISH**

in situ hybridization

**LHRH**

luteinizing hormone-releasing hormone

**MRI**

magnetic resonance imaging

**PET**

positron emission tomography

## NCCN Abbreviations and Acronyms

**NCCN®**

National Comprehensive Cancer Network®

**NCCN Patient Guidelines®**

NCCN Guidelines for Patients®

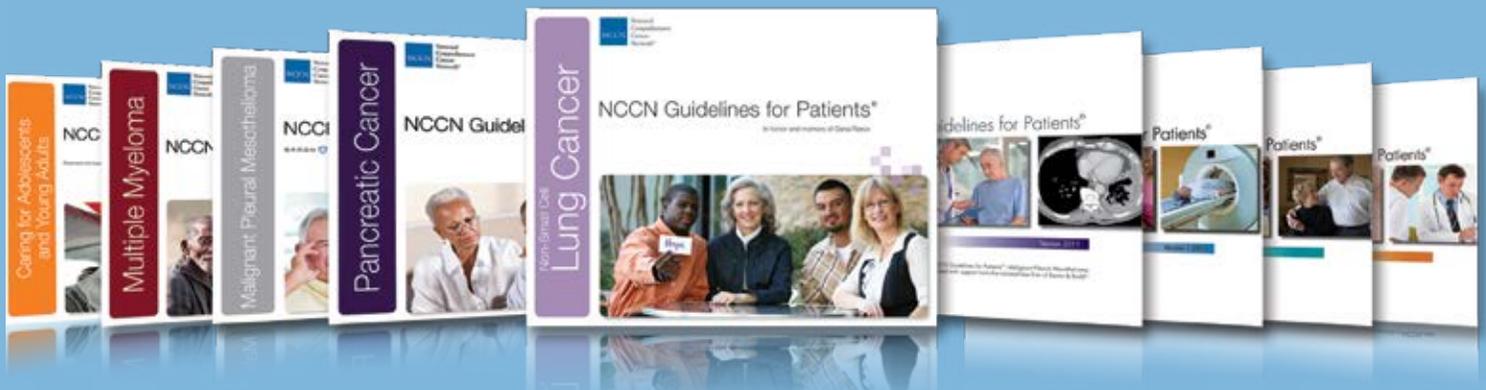
**NCCN Guidelines®**

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



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# NCCN Panel Members for Breast Cancer

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*Robert H. Lurie Comprehensive Cancer  
Center of Northwestern University*

**Benjamin O. Anderson, MD /  
Vice Chair**

*Fred Hutchinson Cancer Research Center/  
Seattle Cancer Care Alliance*

**Sarah L. Blair, MD**

*UC San Diego Moores Cancer Center*

**Harold J. Burstein, MD, PhD**

*Dana-Farber/Brigham and Women's Cancer  
Center*

**Amy Cyr, MD**

*Siteman Cancer Center at Barnes-  
Jewish Hospital and Washington  
University School of Medicine*

**Anthony D. Elias, MD**

*University of Colorado Cancer Center*

**William B. Farrar, MD**

*The Ohio State University Comprehensive  
Cancer Center - James Cancer Hospital  
and Solove Research Institute*

**Andres Forero, MD**

*University of Alabama at Birmingham  
Comprehensive Cancer Center*

**Sharon Hermes Giordano, MD, MPH**

*The University of Texas  
MD Anderson Cancer Center*

**Lori J. Goldstein, MD**

*Fox Chase Cancer Center*

**Daniel F. Hayes, MD**

*University of Michigan  
Comprehensive Cancer Center*

**Clifford A. Hudis, MD**

*Memorial Sloan Kettering  
Cancer Center*

**Steven Jay Isakoff, MD, PhD**

*Massachusetts General Hospital  
Cancer Center*

**P. Kelly Marcom, MD**

*Duke Cancer Institute*

**Ingrid A. Mayer, MD**

*Vanderbilt-Ingram Cancer Center*

**Beryl McCormick, MD**

*Memorial Sloan Kettering  
Cancer Center*

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*The Sidney Kimmel Comprehensive  
Cancer Center at Johns Hopkins*

**Mark Pegram, MD**

*Stanford Cancer Institute*

**Lori J. Pierce, MD**

*University of Michigan  
Comprehensive Cancer Center*

**Elizabeth C. Reed, MD**

*Fred & Pamela Buffett Cancer  
Center at The Nebraska  
Medical Center*

**Kilian E. Salerno, MD**

*Roswell Park Cancer Institute*

**Lee S. Schwartzberg, MD, FACP**

*St. Jude Children's  
Research Hospital/  
The University of Tennessee  
Health Science Center*

**Mary Lou Smith, JD, MBA**

*Patient Advocate  
Research Advocacy Network*

**Hatem Soliman, MD**

*Moffitt Cancer Center*

**George Somlo, MD**

*City of Hope Comprehensive  
Cancer Center*

**John H. Ward, MD**

*Huntsman Cancer Institute  
at the University of Utah*

**Richard Zellars, MD**

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# NCCN Member Institutions

Fred & Pamela Buffett Cancer Center at The Nebraska Medical Center  
Omaha, Nebraska  
800.999.5465  
[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  
[dfbwcc.org](http://dfbwcc.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  
Philadelphia, Pennsylvania  
888.369.2427  
[foxchase.org](http://foxchase.org)

Huntsman Cancer Institute at the University of Utah  
Salt Lake City, Utah  
877.585.0303  
[huntsmancancer.org](http://huntsmancancer.org)

Fred Hutchinson Cancer Research Center/ Seattle Cancer Care Alliance  
Seattle, Washington  
206.288.7222 • [seattlecca.org](http://seattlecca.org)  
206.667.5000 • [fhcrc.org](http://fhcrc.org)

The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins  
Baltimore, Maryland  
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  
Phoenix/Scottsdale, Arizona  
Jacksonville, Florida  
Rochester, Minnesota  
800.446.2279 • Arizona  
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  
Tampa, Florida  
800.456.3434  
[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  
Buffalo, New York  
877.275.7724  
[roswellpark.org](http://roswellpark.org)

Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine  
St. Louis, Missouri  
800.600.3606  
[siteman.wustl.edu](http://siteman.wustl.edu)

St. Jude Children's Research Hospital/ The University of Tennessee Health Science Center  
Memphis, Tennessee  
888.226.4343 • [stjude.org](http://stjude.org)  
901.683.0055 • [westclinic.com](http://westclinic.com)

Stanford Cancer Institute  
Stanford, California  
877.668.7535  
[cancer.stanford.edu](http://cancer.stanford.edu)

University of Alabama at Birmingham Comprehensive Cancer Center  
Birmingham, Alabama  
800.822.0933  
[www3.ccc.uab.edu](http://www3.ccc.uab.edu)

UC San Diego Moores Cancer Center  
La Jolla, California  
858.657.7000  
[cancer.ucsd.edu](http://cancer.ucsd.edu)

UCSF Helen Diller Family Comprehensive Cancer Center  
San Francisco, California  
800.689.8273  
[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  
[mccancer.org](http://mccancer.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)



# Index

- 2<sup>nd</sup> opinion** 63
- antiestrogen** 46
- aromatase inhibitors** 47–50, 53
- axillary lymph nodes** 7–8, 28, 35, 58
- biopsy** 15–16, 28, 35, 56
- bone scan** 13–14, 56–57
- breast reconstruction** 36–37
- chemotherapy** 22–30, 34–35, 40, 46, 58–59
- clinical stage** 8
- computed tomography (CT) scan** 13–14, 30, 56
- fertility counseling** 17
- genetic counseling** 17, 56
- HER2** 15, 22–27, 29–30
- hormone receptor** 14–15
- hormone therapy** 23, 46–50, 53, 58–59
- lumpectomy** 32–33, 34, 36
- lymph node dissection** 28, 35–36, 58
- magnetic resonance imaging (MRI)** 13, 52, 56–57
- mammography** 12–13, 28, 33, 52
- mastectomy** 23, 33–34, 36–37, 58
- medical history** 10, 17, 52, 56
- member institutions** 74
- nipple replacement** 37
- panel members** 73
- pathologic stage** 8, 42
- pathology report** 15
- physical exam** 10, 12–13, 16, 28–29, 31, 42, 52, 57
- positron emission tomography (PET) scan** 14, 56
- radiation therapy** 29, 32, 40–44, 47, 58–59
- survivorship** 63
- symptom control** 63
- targeted therapy** 23
- treatment plan** 62
- volume displacement** 36



NCCN Guidelines for Patients®

# Stage III Breast Cancer

Version 1.2014

The NCCN Foundation® gratefully acknowledges Celgene, Genentech, and Genomic Health for their support for the availability of the NCCN Guidelines for Patients®.



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215.690.0300

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