



## Breast Cancer in Men

### What is cancer?

The body is made up of trillions of living cells. Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all start because of out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell.

Cells become cancer cells because of damage to DNA. DNA is in every cell and directs all its actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn't die like it should. Instead, this cell goes on making new cells that the body does not need. These new cells will all have the same damaged DNA as the first cell does.

People can inherit damaged DNA, but most DNA damage is caused by mistakes that happen while the normal cell is reproducing or by something in our environment. Sometimes the cause of the DNA damage is something obvious, like cigarette smoking. But often no clear cause is found.

In most cases the cancer cells form a tumor. Some cancers, like leukemia, rarely form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Cancer cells often travel to other parts of the body, where they begin to grow and form new tumors that replace normal tissue. This process is called metastasis. It happens when the cancer cells get into the bloodstream or lymph vessels of our body.

No matter where a cancer may spread, it is always named for the place where it started. For example, breast cancer that has spread to the liver is still called breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bone is metastatic prostate cancer, not bone cancer.

Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

Not all tumors are cancerous. Tumors that aren't cancer are called benign. Benign tumors can cause problems – they can grow very large and press on healthy organs and tissues. But they cannot grow into (invade) other tissues. Because they can't invade, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

## What is breast cancer in men?

A breast cancer is a malignant tumor that starts from cells of the breast. A *malignant tumor* is a group of cancer cells that may grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. Breast cancer occurs mainly in women, but men can get it, too. Many people do not realize that men have breast tissue and that they can develop breast cancer.

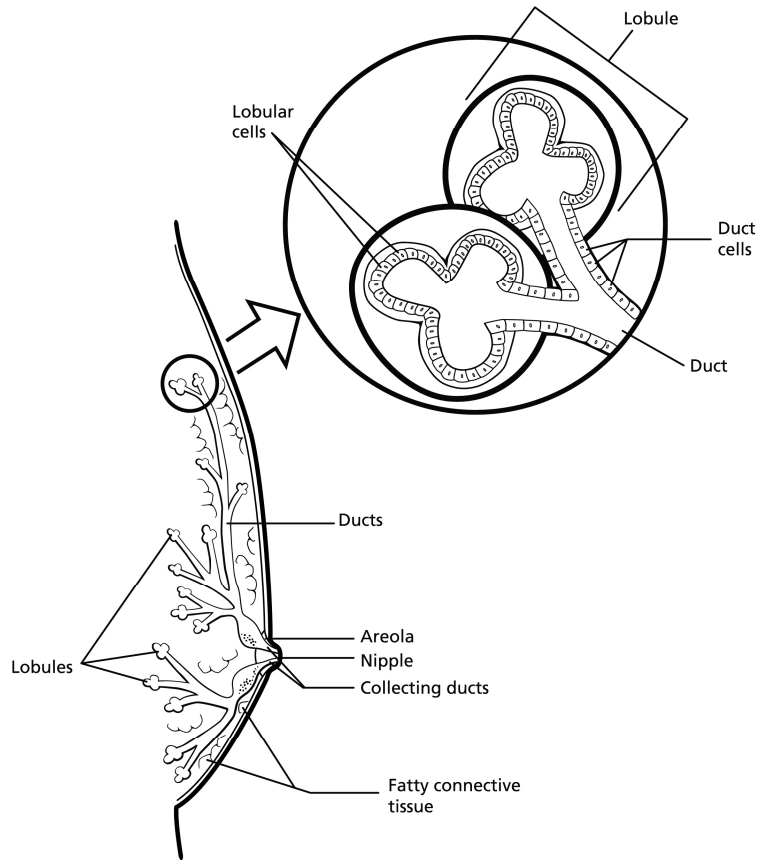
### Normal breast structure

To understand breast cancer, it helps to have some basic knowledge about the normal structure of the breasts.

The breast is made up mainly of lobules (milk-producing glands in women), ducts (tiny tubes that carry the milk from the lobules to the nipple), and stroma (fatty tissue and connective tissue surrounding the ducts and lobules, blood vessels, and lymphatic vessels).

Until puberty (usually around 13 or 14), young boys and girls have a small amount of breast tissue consisting of a few ducts located under the nipple and areola (area around the nipple). At puberty, a girl's ovaries make female hormones, causing breast ducts to grow, lobules to form at the ends of ducts, and the amount of stroma to increase. In boys, hormones made by the testicles keep breast tissue from growing much. Men's breast tissue has ducts, but only a few if any lobules.

Like all cells of the body, a man's breast duct cells can undergo cancerous changes. But breast cancer is less common in men because their breast duct cells are less developed than those of women and because their breast cells are not constantly exposed to the growth-promoting effects of female hormones.

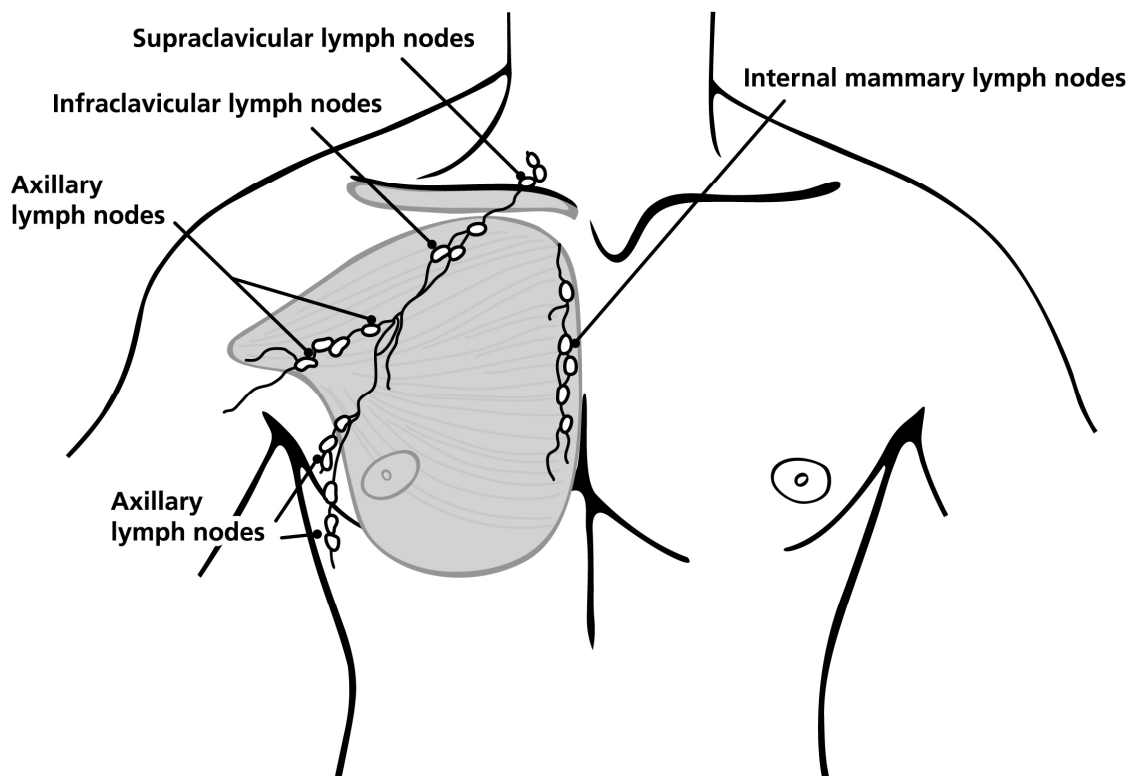


## The lymph (lymphatic) system of the breast

The lymph system is important to understand because it is one of the ways that breast cancers can spread. This system has several parts.

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

Most lymphatic vessels in the breast connect to lymph nodes under the arm (axillary nodes). Some lymphatic vessels connect to lymph nodes near the breast bone (internal mammary nodes) and either above or below the collarbone (supraclavicular or infraclavicular nodes).



It's important to know if the cancer cells have spread to lymph nodes. If they have, there is a higher chance that the cells could have gotten into the bloodstream and spread (metastasized) to other sites in the body. This is important to know when you are choosing a treatment. The more lymph nodes with breast cancer cells (positive lymph nodes), the more likely it is that the cancer might be found in other organs as well. Still, not all men who have positive lymph nodes develop metastases, and in some cases a man can have negative lymph nodes and later develop metastases.

## Benign breast conditions

Men can also have some benign (not cancerous) breast disorders.

### Benign breast tumors

There are many types of benign breast tumors (abnormal lumps or masses of tissue), such as papillomas and fibroadenomas. Benign breast tumors do not spread outside the breast and are not life threatening. Benign tumors are common in women but are very rare in men.

### Gynecomastia

Gynecomastia is the most common male breast disorder. It is not a tumor but rather an increase in the amount of a man's breast tissue. Usually, men have too little breast tissue

to be felt or noticed. A man with gynecomastia has a button-like or disk-like growth under his nipple and areola, which can be felt and sometimes seen. Although gynecomastia is much more common than breast cancer in men, both can be felt as a growth under the nipple, which is why it's important to have any such lumps checked by your doctor.

Gynecomastia is common among teenage boys because the balance of hormones in the body changes during adolescence. It is also common in older men due to changes in their hormone balance.

In rare cases, gynecomastia occurs because tumors or diseases of certain endocrine (hormone-producing) glands cause a man's body to make more estrogen (the main female hormone). Men's glands normally make some estrogen, but it is not enough to cause breast growth. Diseases of the liver, which is an important organ in male and female hormone metabolism, can change a man's hormone balance and lead to gynecomastia. Obesity (being extremely overweight) can also cause higher levels of estrogens in men.

Some medicines can cause gynecomastia. These include some drugs used to treat ulcers and heartburn, high blood pressure, and heart failure. Men with gynecomastia should ask their doctors if any medicines they are taking might be causing this condition.

Klinefelter syndrome, a rare genetic condition, can lead to gynecomastia as well as increase a man's risk of developing breast cancer. This condition is discussed further in the section, "What are the risk factors for breast cancer in men?"

## Breast cancer general terms

Here are some of the key words used to describe breast cancer.

### **Carcinoma**

This is a term used to describe a cancer that begins in the lining layer (epithelial cells) of organs such as the breast. Nearly all breast cancers are carcinomas (either ductal carcinomas or lobular carcinomas).

### **Adenocarcinoma**

An adenocarcinoma is a type of carcinoma that starts in glandular tissue (tissue that makes and secretes a substance). The ducts and lobules of the breast are glandular tissue (they make breast milk in women), so cancers starting in these areas are sometimes called adenocarcinomas.

### **Carcinoma in situ**

This term is used for an early stage of cancer, when it is confined to the layer of cells where it began. In breast cancer, *in situ* means that the abnormal cells remain confined to ducts (ductal carcinoma in situ, or DCIS). These cells have not grown into (invaded) deeper tissues in the breast or spread to other organs in the body. Ductal carcinoma in situ

of the breast is sometimes referred to as *non-invasive* or *pre-invasive* breast cancer because it may develop into an invasive breast cancer if left untreated.

When cancer cells are confined to the lobules it is called lobular carcinoma in situ. This is not actually a true pre-invasive cancer because it does not turn into an invasive cancer if left untreated.

### **Invasive (infiltrating) carcinoma**

An invasive cancer is one that has already grown beyond the layer of cells where it started (as opposed to carcinoma in situ). Most breast cancers are invasive carcinomas, either invasive ductal carcinoma or invasive lobular carcinoma.

## Types of breast cancer in men

### **Ductal carcinoma in situ (DCIS)**

In DCIS (also known as *intraductal carcinoma*), cancer cells form in the breast ducts but do not grow through the walls of the ducts into the fatty tissue of the breast or spread outside the breast. DCIS accounts for about 1 in 10 cases of breast cancer in men. It is almost always curable with surgery.

### **Infiltrating (or invasive) ductal carcinoma (IDC)**

This type of breast cancer breaks through the wall of the duct and grows through the fatty tissue of the breast. At this point, it can spread (metastasize) to other parts of the body. At least 8 out of 10 male breast cancers are IDCs (alone or mixed with other types of invasive or in situ breast cancer). Because the male breast is much smaller than the female breast, all male breast cancers start relatively close to the nipple, so they are more likely to spread to the nipple. This is different from Paget disease as described below.

### **Infiltrating (or invasive) lobular carcinoma (ILC)**

This type of breast cancer starts in the breast lobules (collections of cells that, in women, produce breast milk) and grows into the fatty tissue of the breast. ILC is very rare in men, accounting for only about 2% of male breast cancers. This is because men do not usually have much lobular tissue.

### **Lobular carcinoma in situ (LCIS)**

In LCIS, abnormal cells form in the lobules, but they do not grow into the fatty tissue of the breast or spread outside the breast. Although LCIS is sometimes grouped with DCIS as a type of non-invasive breast cancer, most breast specialists think it is a risk factor for developing breast cancer rather than a true non-invasive cancer. As with invasive lobular carcinoma, LCIS is very rare in men.

## **Paget disease of the nipple**

This type of breast cancer starts in the breast ducts and spreads to the nipple. It may also spread to the areola (the dark circle around the nipple). The skin of the nipple usually appears crusted, scaly, and red, with areas of itching, oozing, burning, or bleeding. The fingertips can be used to detect a possible lump within the breast.

Paget disease may be associated with DCIS or with infiltrating ductal carcinoma. It accounts for about 1% of female breast cancers and a higher percentage of male breast cancers.

## **Inflammatory breast cancer**

Inflammatory breast cancer is an aggressive, but rare type of breast cancer. It causes the breast to be swollen, red, warm and tender rather than forming a lump. It can be mistaken for an infection of the breast. This is very rare in men.

## **What are the key statistics about breast cancer in men?**

The most recent American Cancer Society estimates for male breast cancer in the United States are for 2012:

- About 2,190 new cases of invasive breast cancer will be diagnosed among men
- About 410 men will die from breast cancer

Breast cancer is about 100 times less common among men than among women. For men, the lifetime risk of getting breast cancer is about 1 in 1,000. The number of breast cancer cases in men relative to the population has been fairly stable over the last 30 years.

The prognosis (outlook) for men with breast cancer was once thought to be worse than that for women, but recent studies have not found this to be true. In fact, men and women with the same stage of breast cancer have a fairly similar outlook for survival.

## **What are the risk factors for breast cancer in men?**

A risk factor is anything that affects your chance of getting a disease such as cancer. Different cancers have different risk factors. For example, exposing skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for cancers of the lung, mouth, larynx (voice box), bladder, kidney, and several other organs.

But risk factors don't tell us everything. Having a risk factor, or even several, does not mean that you will get the disease. Some men with one or more breast cancer risk factors never develop the disease, while most men with breast cancer have no apparent risk

factors. Even when someone has a risk factor, there is no way to prove that it actually caused the cancer.

We don't yet completely understand the causes of breast cancer in men, but researchers have found several factors that may increase the risk of getting it. As with female breast cancer, many of these factors are related to sex hormone levels in the body.

## Aging

Aging is an important risk factor for the development of breast cancer in men. The risk of breast cancer goes up as a man ages. Men with breast cancer are on average about 68 years old when they are diagnosed.

## Family history of breast cancer

Breast cancer risk is increased if other members of the family (blood relatives) have had breast cancer. About 1 out of 5 men with breast cancer have close male or female relatives with the disease.

## Inherited gene mutations

A mutation (change) in the BRCA2 gene, which is responsible for some breast cancers in women, probably accounts for about 1 in 10 breast cancers in men. BRCA1 mutations can also cause breast cancer in men, but the risk is not as high as it is for mutations in the BRCA2 gene. People with these mutations typically have a strong family history of breast and/or ovarian cancer. Cancers in these families often occur in people younger (under 60) than the usual age.

Other mutations that may be responsible for some breast cancers in men include those in genes called *CHEK2* and *PTEN*.

## Klinefelter syndrome

Klinefelter syndrome is a congenital condition (present at birth) that affects about 1 in 1,000 men. Normally the cells in men's bodies have a single X chromosome along with a Y chromosome, while women's cells have 2 X chromosomes. Men with this condition have cells with a Y chromosome plus at least 2 X chromosomes (sometimes as many as 4).

Men with Klinefelter syndrome also have small testicles (smaller than usual). Often, they are unable to produce functioning sperm cells, making them infertile. Compared with other men, they have lower levels of androgens (male hormones) and more estrogens (female hormones). For this reason, they often develop gynecomastia (benign male breast growth).

Some studies have found that men with Klinefelter syndrome are more likely to get breast cancer than other men. One study of men with this syndrome found that the risk of getting breast cancer was about 1%. But this is a hard area to study because these are both

uncommon problems, and it is hard to collect enough cases to be sure. The risk seems to be increased, but overall it is still low because this is such an uncommon cancer, even for men with Klinefelter syndrome.

## Radiation exposure

A man whose chest area has been treated with radiation (such as for the treatment of a cancer in the chest, such as lymphoma) has an increased risk of developing breast cancer.

## Alcohol

Heavy drinking (of alcoholic beverages) increases the risk of breast cancer in men. This may be because of its effects on the liver (see next paragraph).

## Liver disease

The liver plays an important role in sex hormone metabolism by making binding proteins that carry the hormones in the blood. These binding proteins affect the hormones' activity. Men with severe liver disease such as cirrhosis have relatively low levels of androgens and higher estrogen levels. Therefore, they may have an increased risk of developing breast cancer.

## Estrogen treatment

Estrogen-related drugs are sometimes used in hormonal therapy for men with prostate cancer. This treatment may slightly increase their breast cancer risk. However, this risk is small compared with the benefits of this treatment in slowing the growth of prostate cancer.

Men taking high doses of estrogens as part of a sex change procedure may also have a higher breast cancer risk.

## Obesity

Recent studies have shown that women's breast cancer risk is increased by obesity (being extremely overweight) during her adult life. Obesity is probably a risk factor for male breast cancer as well. The reason is that fat cells in the body convert male hormones (androgens) into female hormones (estrogens). This means that obese men have higher levels of estrogens in their body. Some obese men may notice that they don't have to shave as frequently as other men. They might also have trouble fathering children. Regular exercise and maintaining a healthy weight may help reduce the risk of breast cancer, as well as that of many other diseases and cancers.

## Testicular conditions

Some studies have suggested that certain conditions that affect testicles, such as having an undescended testicle, having mumps as an adult, or having one or both testicles surgically removed (orchietomy) may increase breast cancer risk. More research is needed in this area.

## Certain occupations

Some reports have suggested an increased risk in men who work in hot environments such as steel mills. This could be because long-term exposure to higher temperature can affect the testicles, which in turn would affect hormone levels. Men heavily exposed to gasoline fumes might also have a higher risk. More research is needed to confirm these findings.

# Do we know what causes breast cancer in men?

Although certain risk factors may increase a man's chances of developing breast cancer, the cause of most breast cancers in men is unknown.

## Hormone levels

Breast cells normally grow and divide in response to female hormones such as estrogen. The more cells divide, the more chances there are for mistakes to be made when they are copying their DNA. These DNA changes can eventually lead to cancer (see below).

Factors that change the ratio of female and male hormones in the body can therefore have an effect on breast cancer risk. Many of these were described in the section, "What are the risk factors for breast cancer in men?"

## Gene changes (mutations)

Researchers are making great progress in understanding how certain changes in DNA can cause normal cells to become cancerous. DNA is the chemical in each of our cells that makes up our *genes*, the instructions for how our cells function. We usually look like our parents because they are the source of our DNA. However, DNA affects more than how we look.

Some genes contain instructions for controlling when our cells grow, divide, and die. Certain genes that speed up cell division are called *oncogenes*. Others that slow down cell division or cause cells to die at the appropriate time are called *tumor suppressor genes*. Cancers can be caused by DNA mutations (defects) that turn on oncogenes or turn off tumor suppressor genes.

## **Acquired gene mutations**

Most DNA mutations related to male breast cancer occur during life rather than having been inherited before birth. It's not clear what causes most of these mutations. Radiation to the breast area is a factor in a small number of cases. Some acquired mutations of oncogenes and/or tumor suppressor genes may be the result of cancer-causing chemicals in our environment or diet, but so far studies have not identified any chemicals that are responsible for these mutations in male breast cancers.

## **Inherited gene mutations**

Certain inherited DNA changes can cause a high risk of developing certain cancers and are responsible for cancers that run in some families.

Some breast cancers are linked to inherited mutations of the BRCA1 or BRCA2 tumor suppressor genes. Normally, these genes make proteins that help cells recognize and/or repair DNA damage and prevent them from growing abnormally. But if a person has inherited a mutated gene from either parent, the chances of developing breast cancer are higher.

In women, mutations of BRCA1 and BRCA2 are responsible for about 5% to 10% of breast cancers. Women with either of these altered genes have a lifetime breast cancer risk of up to 80%.

In men, changes in the BRCA2 gene seem to be responsible for about 10% of breast cancer cases. The lifetime breast cancer risk for men with BRCA2 mutations is about 5% to 10%, which is much higher than for other men.

BRCA1 seems to play a role in only a small number of male breast cancers, but it may be more common in Jewish men. Recent studies suggest that BRCA1 mutations may increase the lifetime risk of breast cancer in men to about 1%.

## **Genetic testing**

Genetic testing can look for mutations in the BRCA1 and BRCA2 genes (or less commonly in other genes related to breast cancer). Testing may be helpful in some situations, but the pros and cons need to be considered carefully. For more information, see the section, "Can breast cancer in men be found early?"

## **Can breast cancer in men be prevented?**

There are some things a man can do to lower his risk of breast cancer: maintaining an ideal body weight and restricting alcohol consumption are 2 of them. But since the cause of most breast cancers is not known, there is no known way to prevent them.

For now, the best strategies for reducing the number of deaths caused by this disease are early detection and prompt treatment. Early detection has been a problem for men, who

tend to ignore breast lumps and see their doctor only when they have gotten large. In general, men are diagnosed with cancers at more advanced stages than are women.

## **Can breast cancer in men be found early?**

Early detection improves the chances that male breast cancer can be treated successfully.

### **Differences affecting early detection of male and female breast cancers**

There are many similarities between breast cancer in men and women, but some important differences affect early detection.

#### **Breast size**

The most obvious difference between the male and female breast is size. Because men have very little breast tissue, it is easier for men and their health care professionals to feel small masses (tumors). On the other hand, because men have so little breast tissue, cancers do not need to grow very far to reach the nipple, the skin covering the breast, or the muscles underneath the breast. So even though breast cancers in men tend to be slightly smaller than in women when they are first found, they have more often already spread to nearby tissues or lymph nodes. The extent of spread is one of the most important factors in the prognosis (outlook) of a breast cancer.

#### **Lack of awareness**

Another difference is that breast cancer is common among women and rare among men. Women tend to be aware of this disease and its possible warning signs, but most men do not realize they have even a small risk of being affected. Some men ignore breast lumps or think they are caused by an infection or some other reason, and they do not get medical treatment until the mass has had a chance to grow. Some men are embarrassed when they find a breast lump and worry that someone might question their masculinity. This may also delay diagnosis and reduce a man's chances for successful treatment.

Because breast cancer is so uncommon in men, there is unlikely to be any benefit in screening men in the general population for breast cancer.

#### **For men who are or may be at high risk**

Mammography (x-rays of the breast) along with careful breast exams might be useful for screening men with a strong family history of breast cancer and/or with BRCA mutations found by genetic testing. Men with such a history should discuss this with their doctor.

## Genetic testing

If you have a strong family history of breast cancer (in men or women) and/or ovarian cancer that might be caused by a BRCA mutation, you might want to consider genetic testing to determine if you have inherited a mutated BRCA gene. If the test detects a mutated BRCA gene, you and your health care team can watch carefully for early signs of cancer. Mammography can be effective in finding early breast cancer in men.

If you are thinking about having genetic testing, it is strongly recommended that you talk first to a genetic counselor, nurse, or doctor qualified to explain and interpret these tests. It is very important to understand what genetic testing can and can't tell you, and to carefully weigh the benefits and risks of testing before having it done. Test results are not always clear cut, and even if they are, it's not always clear what should be done about them. There may be other concerns as well, such as what the results might mean for other family members. Testing is also expensive and may not be covered by some health insurance plans.

For more information, see our separate document, *Genetic Testing: What You Need to Know*. You may also want to visit the National Cancer Institute Web site ([www.cancer.gov/cancertopics/Genetic-Testing-for-Breast-and-Ovarian-Cancer-Risk](http://www.cancer.gov/cancertopics/Genetic-Testing-for-Breast-and-Ovarian-Cancer-Risk)).

There have been concerns that people with abnormal genetic test results might not be able to get health or other insurance or that coverage may only be available at a much higher cost, but many states have passed laws that prevent insurers from denying insurance on the basis of genetic testing. The federal government has also passed a law (that went into effect in May 2009) that bars discrimination by health insurers or employers based on genetic information, although it does not address life insurance or other areas. To learn about state laws against genetic testing discrimination, you may want to visit the Web site of the National Conference of State Legislatures ([www.ncsl.org/programs/health/genetics/ndishlth.htm](http://www.ncsl.org/programs/health/genetics/ndishlth.htm)).

## How is breast cancer in men diagnosed?

### Signs and symptoms

Men need to know that breast cancer is not limited to only women. Possible signs of breast cancer to watch for include:

- A lump or swelling, which is usually (but not always) painless
- Skin dimpling or puckering
- Nipple retraction (turning inward)
- Redness or scaling of the nipple or breast skin
- Discharge from the nipple

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

These changes aren't always caused by cancer. For example, most breast lumps in men are due to gynecomastia (a harmless enlargement of breast tissue). Still, if you notice any breast changes, you should see your health care professional as soon as possible.

## Medical history and physical exam

If there is a chance you may have breast cancer, your doctor will want to get a complete personal and family medical history. This may give some clues about the cause of any symptoms you are having and if you might be at increased risk for breast cancer.

A thorough clinical breast exam will be done to locate any lumps or suspicious areas and to feel their texture, size, and relationship to the skin and muscle tissue. The doctor may also examine the rest of your body to look for any evidence of possible spread, such as enlarged lymph nodes (especially under the arm) or an enlarged liver. Your general physical condition may also be evaluated.

## Tests used to evaluate breast disease

If the history and physical exam suggest breast cancer may be possible, several types of tests may be done.

### **Diagnostic mammography**

A mammogram is an x-ray exam of the breast. It is called a *diagnostic* mammogram when it is done because problems are present. In some cases, special images known as *cone* or *spot views with magnification* are used to make a small area of abnormal breast tissue easier to evaluate. The results of this test might suggest that a biopsy is needed to tell if the abnormal area is cancer. Mammography is often more accurate in men than women, since men do not have dense breasts or other common breast changes that might interfere with the test.

### **Breast ultrasound**

Ultrasound, also known as *sonography*, uses high-frequency sound waves to outline a part of the body. For this test, a small, microphone-like instrument called a transducer is placed on the skin (which is first lubricated with gel). It emits sound waves and picks up the echoes as they bounce off body tissues. The echoes are converted by a computer into a black and white image on a computer screen. This test is painless and does not expose you to radiation.

Breast ultrasound is sometimes used to evaluate breast abnormalities that are found during mammography or a physical exam. It can be useful to see if a breast lump or mass

is a cyst or a tumor. A cyst is a non-cancerous, fluid-filled sac that can feel the same as a tumor on physical exam. A mass that is not a cyst will often need to be biopsied.

## **Magnetic resonance imaging (MRI) of the breast**

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

MRI scans can take a long time — often up to an hour. You have to lie inside a narrow tube, face down on a platform specially designed for the procedure. The platform has openings for each breast that allow them to be imaged without compression. The platform contains the sensors needed to capture the MRI image. It is important to remain very still throughout the exam. Lying in the tube can feel confining and might upset people with claustrophobia (a fear of enclosed spaces). The machine also makes loud buzzing and clicking noises that you may find disturbing. Some places will give you headphones with music to block this noise out. MRIs are also expensive, although insurance plans generally pay for them in some situations, such as once cancer is diagnosed.

MRI machines are quite common, but they need to be specially adapted to look at the breast. It's important that MRI scans of the breast be done on one of these specially adapted machines and that the MRI facility can also do a MRI guided biopsy if it is needed.

MRI can be used to better examine suspicious areas found by a mammogram. MRI is also used in someone who has been diagnosed with breast cancer to better determine the actual size of the cancer and to look for any other cancers in the breast.

## **Nipple discharge exam**

Fluid leaking from the nipple is called *nipple discharge*. If you have a nipple discharge, you should have it checked by your doctor. If there is blood in this fluid, you might need more tests. One test collects some of the fluid to look at under a microscope to see if cancer cells are present. This test is often not helpful, since a breast cancer can still be there even when no cancer cells are found in the nipple discharge. Other tests may be more helpful, such as a mammogram or breast ultrasound. If you have a breast mass, you will probably need a biopsy (even if the nipple discharge does not contain cancer cells or blood).

## **Biopsy**

A biopsy removes a body tissue sample to be looked at under a microscope. A biopsy is the only way to tell if a breast abnormality is cancerous. Unless the doctor is sure the lump is not cancer, this should always be done. There are several types of biopsies. Your doctor will choose the type of biopsy based on your situation.

**Fine needle aspiration biopsy:** Fine needle aspiration (FNA) biopsy is the easiest and quickest biopsy technique. The doctor uses a very thin, hollow needle attached to a syringe to withdraw (aspirate) a small amount of tissue from a suspicious area. The doctor can guide the needle into the area of the breast abnormality while feeling the lump. A local anesthetic (numbing medicine) may or may not be used. Because such a thin needle is used for the biopsy, the process of getting the anesthetic may actually be more uncomfortable than the biopsy itself.

When the samples of most breast abnormalities are looked at under a microscope, they show if they are benign or cancerous. Sometimes, though, the results of the FNA are not clear, and another type of biopsy is needed.

**Core needle biopsy:** For a core biopsy, the doctor removes a small cylinder of tissue from a breast abnormality to be looked at under a microscope. The needle used in this technique is larger than that used for FNA. The biopsy is done with local anesthesia in the doctor's office.

A core biopsy uses a larger needle to sample breast changes the doctor felt or pinpointed by ultrasound or a mammogram. (When mammograms taken from different angles are used to pinpoint the biopsy site, this is known as a stereotactic core needle biopsy.) In some centers, the biopsy can be guided by an MRI scan.

Because it removes larger pieces of tissue, a core needle biopsy is more likely than an FNA to provide a clear diagnosis, although it may still miss some cancers.

**Surgical (open) biopsy:** Sometimes, surgery is needed to remove all or part of the lump for microscopic examination. Most often, the surgeon removes the entire mass or abnormal area, as well as a surrounding margin of normal-appearing breast tissue. This is called an *excisional biopsy*. If the mass is too large to be removed easily, only part of it may be removed. This is called an *incisional biopsy*.

In rare cases, a surgical biopsy can be done in the doctor's office, but it is more commonly done in the hospital's outpatient department under local anesthesia (you are awake, but the area around the breast is numb), often with intravenous sedation (medicine given into a vein to make you drowsy).

A surgical biopsy is more involved than an FNA biopsy or a core needle biopsy, and it often requires several stitches and may leave a scar. Sometimes, though, this type of biopsy is needed to get an accurate diagnosis.

All biopsies can cause bleeding and can lead to swelling. This can make it seem like the breast (or the lump in the breast) is larger after the biopsy. This is generally nothing to worry about and the bleeding and bruising resolve quickly in most cases.

**Lymph node dissection and sentinel lymph node biopsy:** These procedures are done specifically to look for cancer in the lymph nodes. They are described in more detail under "Types of breast surgery" in the "Surgery" section.

## Lab tests of breast cancer biopsy samples

Once breast tissue samples have been obtained from a biopsy, they are looked at in the lab to determine whether cancer is present. If there is enough tissue, the pathologist can usually determine if the cancer is in situ (not invasive) or invasive. The biopsy is also used to determine the cancer's type, such as invasive ductal carcinoma or invasive lobular carcinoma. Most breast cancers in men are invasive ductal carcinomas. Relatively few cells are removed with an FNA biopsy and they often become separated from the underlying breast tissue, so it is often only possible to say that cancer cells are present without being able to say if the cancer is in situ or invasive. Other lab tests can help determine how quickly a cancer is likely to grow and (to some extent) what treatments are likely to be effective.

If a benign condition is diagnosed, no further treatment is needed. If the diagnosis is cancer, there should be time for you to learn about the disease and to discuss treatment options with your cancer care team, friends, and family. It is usually not necessary to rush into treatment. You may want to get a second opinion before deciding which treatment will be best for you.

### Grading

A pathologist (a doctor who specializes in diagnosing disease in tissue samples) also assigns a *histologic grade* to the cancer (known as *grading*). The grade is a measure of how closely the cancer in the biopsy sample looks like normal breast tissue and how fast the cancer cells are dividing. It is based on the arrangement of the cells in relation to each other, as well as features of individual cells. The grade helps predict the patient's prognosis (outlook). In general, a lower grade number indicates a slower-growing cancer that is less likely to spread, while a higher number indicates a faster-growing cancer that is more likely to spread.

- Grade 1 (well differentiated) cancers have relatively normal-looking cells that do not appear to be growing rapidly and are arranged in small tubules.
- Grade 2 (moderately differentiated) cancers have features between grades 1 and 3.
- Grade 3 (poorly differentiated) cancers are formed by cells that appear very abnormal, grow rapidly, and rarely form tubules.

This system of grading is used for invasive cancers but not for in situ cancers.

### Estrogen receptor (ER) and progesterone receptor (PR) status

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

An important step in evaluating a breast cancer is to test a portion of the cancer removed during the biopsy (or surgery) for the presence of estrogen and progesterone receptors.

Cancer cells may contain neither, one, or both of these receptors. Breast cancers that contain estrogen receptors are often referred to as *ER-positive* cancers, while those containing progesterone receptors are called *PR-positive* cancers. If either type of receptor is present, the cancer is said to be hormone receptor-positive.

About 9 out of 10 breast cancers are ER-positive, PR-positive, or are positive for both types of receptor. These cancers tend to grow more slowly than cancers without these receptors and are much more likely to respond to hormonal therapy (see the section, "Hormone therapy").

## **HER2/neu status**

In a small number of breast cancers in men, the cells have too much of a growth-promoting protein called HER2/neu (often just shortened to HER2). Tumors with increased levels of HER2/neu are referred to as *HER2-positive*.

The HER2/neu gene instructs cells to make this protein, and cells can become HER2-positive breast cancers by having too many copies of the HER2/neu gene (known as gene amplification). Cancer cells with greater than normal amounts of the HER2/neu protein tend to grow and spread more aggressively than other breast cancers.

All newly diagnosed breast cancers should be tested for HER2/neu because treatment aimed at the HER2/neu protein can help improve prognosis (outlook). See the section, "Targeted therapy" for more information on drugs that target this protein.

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

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

Many breast cancer specialists think the FISH test gives more accurate results than IHC, but it is more expensive and takes longer to get the results. Often the IHC test is used first. If the results are 1+ (or 0), the cancer is considered HER2-negative. People with HER2-negative tumors are not treated with drugs that target HER2 (like trastuzumab). If the test comes back 3+, the cancer is HER2-positive. Patients with HER2-positive tumors may be treated with drugs that target HER2 like trastuzumab (Herceptin<sup>®</sup>) or lapatinib (Tykerb<sup>®</sup>). When the result is 2+, the HER2 status of the tumor is not clear. This often leads to having the tumor tested with FISH.

A newer type of test, known as *chromogenic in situ hybridization* (CISH), works similarly to FISH, by using small DNA probes to count the number of HER2 genes in breast cancer cells. But this test looks for color changes (not fluorescence) and doesn't require a special microscope, which may make it less expensive. Right now, it is not being used as much as IHC or FISH.

## Tests of ploidy and cell proliferation rate

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

- Flow cytometry uses lasers and computers to measure the amount of DNA in cancer cells suspended in liquid as they flow past the laser beam.
- Image cytometry uses computers to analyze digital images of the cells from a microscope slide.

Flow cytometry can also measure the *S-phase fraction*, which is the percentage of cells in a sample that are replicating (copying) their DNA. DNA replication means that the cell is getting ready to divide into 2 new cells. The rate of cancer cell division can also be estimated by a *Ki-67* test, which identifies cells in the S-phase, as well as cells getting ready to replicate DNA, cells that have just completed DNA replication, and cells in the process of dividing. A high S-phase fraction or Ki-67 labeling index means that the cancer cells are dividing more rapidly, which indicates a more aggressive cancer.

## Tests of gene patterns

Researchers have found that looking at the patterns of a number of specific genes at the same time (sometimes referred to as *gene expression profiling*) can help predict whether or not an early stage breast cancer is likely to come back after initial treatment. This can help when deciding whether to use additional (adjuvant) treatment such as chemotherapy after surgery. Two such tests (Oncotype DX<sup>®</sup> and MammaPrint<sup>®</sup>) look at different sets of genes.

Although some doctors are using these tests (along with other information) to help make decisions about offering chemotherapy, others are waiting for more research to prove they are really helpful. Large clinical trials of these tests are now under way. These tests have been studied mainly in breast cancers in women, and it's not yet clear if they would be as useful in breast cancers in men. Still, men may want to ask their doctors if these tests might be appropriate.

## Imaging tests to look for breast cancer spread

Once breast cancer is diagnosed, one or more of the following tests may be done. Which of these tests (if any) is done depends on how likely it is that the cancer has spread, the size of the tumor, the presence of lymph node spread, and any symptoms you are having.

### Chest x-ray

This test may be done to see if the breast cancer has spread to the lungs.

## **Mammogram**

If they haven't been done already, more extensive mammograms may be done to get more thorough views of both breasts.

## **Bone scan**

A bone scan can help show if a cancer has metastasized (spread) to the bones. It can be more useful than standard x-rays because it can show all of the bones in the body at the same time and can find small areas of cancer spread not seen on plain x-rays.

For this test, a small amount of low-level radioactive material is injected into a vein (intravenously or IV). The substance settles in areas of bone changes throughout the entire skeleton over the course of a couple of hours. You then lie on a table for about 30 minutes while a special camera detects the radioactivity and creates a picture of your skeleton.

Bone changes show up as "hot spots" on your skeleton. They attract the radioactivity. These areas may suggest the presence of metastatic cancer, but arthritis or other bone diseases can also cause the same pattern. To distinguish between these conditions, your cancer care team may use other imaging tests such as simple x-rays or CT or MRI scans to get a better look at the areas that light up, or they may even take biopsy samples of the bone.

## **Computed tomography (CT) scan**

The CT scan is an x-ray test that produces detailed cross-sectional images of your body. Instead of taking a single picture, like a regular x-ray, a CT scanner takes many pictures as it rotates around you while you lie on a table. A computer then combines these pictures into images of slices of the part of your body being studied. In people with breast cancer, this test is most often used to look at the chest and/or abdomen to see if the cancer has spread to other organs, such as the lungs or liver.

Before any pictures are taken, you may be asked to drink 1 to 2 pints of a liquid called *oral contrast*. This helps outline the intestine so that certain areas are not mistaken for tumors. You may also receive an IV (intravenous) line through which a different kind of contrast dye (IV contrast) is injected. This helps better outline structures in your body.

The injection may cause some flushing (a feeling of warmth, especially in the face). Some people are allergic and get hives. Rarely, more serious reactions can occur like trouble breathing or low blood pressure. Be sure to tell the doctor if you have ever had a reaction to any contrast material used for x-rays.

CT scans take longer than regular x-rays, but in general are very quick. You need to lie still on a table while they are being done. During the test, the table moves in and out of the scanner, a ring-shaped machine that completely surrounds the table. You might feel a bit confined by the ring you have to lie in while the pictures are being taken.

**CT guided needle biopsy:** If an abnormal area is seen on a CT scan, it may need to be biopsied to see if it is cancer. The biopsy can be done using the CT scans to precisely guide a biopsy needle into the area. For this procedure, you remain on the CT scanning table while a radiologist advances a biopsy needle through the skin and toward the location of the mass (abnormal area). CT scans are repeated until the doctors are sure that the needle is within the mass. A fine needle biopsy sample (tiny fragment of tissue) or a core needle biopsy sample (a thin cylinder of tissue about ½-inch long and less than 1/8-inch in diameter) is then removed and sent to be looked at under a microscope.

## **Magnetic resonance imaging (MRI) scan**

This use of this test to look at the breast was discussed earlier in this section.

MRI scans are also used to look for cancer that has spread to various parts of the body, just like CT scans. MRI scans are particularly helpful in looking at the brain and spinal cord.

There are some differences between using this test to look at the breast and other areas of the body. Firstly, you will lie face up in the machine. Second, the contrast material called *gadolinium* is not always needed to look at other areas of the body. Also, you may have the option of having the scan in less confining machine known as an "open" MRI machine. The images from an open machine are not always as good, though, so this is not always an option.

## **Ultrasound**

The use of this test to look at the breast was discussed earlier in this section. But ultrasound can also be used to look for cancer that has spread to some other parts of the body.

Abdominal ultrasound can be used to look for tumors in your liver or other abdominal organs. When you have an abdominal ultrasound exam, you simply lie on a table and a technician moves the transducer over the skin overlying the part of your body being examined. Usually, the skin is first lubricated with gel.

## **Positron emission tomography (PET) scan**

For a PET scan, glucose (a form of sugar) that contains a radioactive atom is injected into the blood. Because cancer cells in the body are growing rapidly, they absorb large amounts of the radioactive sugar. After about an hour, a special camera is used to create a picture of areas of radioactivity in the body.

A PET scan is useful when your doctor thinks the cancer may have spread but doesn't know where. The picture is not as finely detailed as a CT or MRI scan, but it can provide helpful information about your whole body. Some machines can perform both a PET and CT scan at the same time (PET/CT scan). The radiologist can compare areas of higher radioactivity on the PET with the appearance of that area on the CT.

This test can be useful in looking for cancer that has spread to distant organs, but it is not very helpful in looking for small deposits of cancer cells in the lymph nodes under the arm (axillary lymph nodes). It is not often used in early stage breast cancer.

## How is breast cancer in men staged?

*Staging* is the process of finding out how far the cancer has spread. The stage of a cancer is one of the most important factors in selecting treatment options.

Depending on the results of your physical exam and biopsy, the doctor may order certain imaging tests, such as a chest x-ray, mammograms, bone scans, computed tomography (CT) scans, magnetic resonance imaging (MRI) scans, and/or positron emission tomography (PET) scans. Blood tests may also be done to evaluate your overall health and to help detect whether the cancer has spread to certain organs.

## The American Joint Committee on Cancer (AJCC) TNM system

A *staging system* is a standardized way for the cancer care team to summarize information about how far a cancer has spread. The most common system used to describe the stages of breast cancer is the American Joint Committee on Cancer (AJCC) TNM system.

The stage of a breast cancer can be based either on the results of physical exam, biopsy, and imaging tests (called the *clinical stage*), or on the results of these tests plus the results of surgery (called the *pathologic stage*). The staging described here is the pathologic stage, which includes the findings after surgery, when the pathologist has looked at the breast mass and removed lymph nodes. Pathologic staging is likely to be more accurate than clinical staging, as it allows the doctor to get a firsthand impression of the extent of the cancer.

The TNM staging system classifies cancers based on their T, N, and M stages:

- The letter **T** followed by a number from 0 to 4 describes the tumor's size and spread to the skin or to the chest wall under the breast. Higher T numbers indicate a larger tumor and/or wider spread to tissues near the breast.
- The letter **N** followed by a number from 0 to 3 indicates whether the cancer has spread to lymph nodes near the breast and, if so, how many lymph nodes are affected.
- The letter **M** followed by a 0 or 1 indicates whether the cancer has spread to distant organs -- for example, the lungs or bones.

### T categories for breast cancer

**TX:** Primary tumor cannot be assessed.

**T0:** No signs of a primary breast tumor.

**Tis:** Carcinoma in situ (either DCIS or Paget disease of the nipple with no associated tumor mass)

**T1** (includes T1a, b, and c): Tumor is 2 cm (3/4 of an inch) or less across.

**T2:** Tumor is more than 2 cm but not more than 5 cm (2 inches) across.

**T3:** Tumor is more than 5 cm across.

**T4:** Tumor of any size growing into the chest wall or skin.

## **N categories for breast cancer (based on looking at the lymph nodes under a microscope)**

Lymph node staging for breast cancer has changed over time as technology has evolved. Earlier methods were useful in finding large deposits of cancer cells in the lymph nodes, but could miss microscopic areas of cancer spread. Over time, newer methods have made it possible to find smaller and smaller deposits of cancer cells. Experts haven't been sure what to do with the new information. Do tiny deposits of cancer cells affect outlook the same way that larger deposits do? How much cancer in the lymph node is needed to see a change in outlook or treatment?

These questions are still being studied, but for now, a deposit of cancer cells must contain at least 200 cells or be at least 0.2 mm across (less than 1/100 of an inch) for it to change the N stage. An area of cancer spread that is smaller than 0.2 mm (or less than 200 cells) doesn't change the stage, but is recorded with abbreviations that reflect the way the cancer spread was detected.

The abbreviation "i+" means that cancer cells were only seen when a special stain, called immunohistochemistry, was used. The abbreviation "mol+" is used if the cancer could only be found using a technique called *PCR*. PCR is a molecular test that can find very small numbers of cells that cannot even be seen using special stains. These very tiny areas are sometimes called *isolated tumor cells*. If the area of cancer spread is at least 0.2 mm (or 200 cells), but still not larger than 2 mm, it is called a *micrometastasis* (1 mm is about the size of the width of a grain of rice). Micrometastases are counted only if there aren't any larger areas of cancer spread. Areas of cancer spread larger than 2 mm are known to affect outlook and do change the N stage. These larger areas are sometimes called *macrometastases*, but may just be called *metastases*.

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

**N0:** Cancer has not spread to nearby lymph nodes.

- **N0(i+):** Tiny amounts of cancer are found in underarm lymph nodes by using special stains. The area of cancer spread contains less than 200 cells and is smaller than 0.2 mm.
- **N0(mol+):** Cancer cells cannot be seen in underarm lymph nodes (even using special stains), but traces of cancer cells were detected using a special test (called PCR)

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

- **N1mi:** Micrometastases (tiny areas of cancer spread) in 1 to 3 lymph nodes under the arm. The areas of cancer spread in the lymph nodes are 2 mm or less across (but at least 200 cancer cells or 0.2mm across).
- **N1a:** Cancer has spread to 1 to 3 lymph nodes under the arm and at least one area of cancer spread is greater than 2 mm across.
- **N1b:** Cancer has spread to internal mammary lymph nodes, but this spread could only be found on sentinel lymph node biopsy (it did not cause the lymph nodes to become enlarged)
- **N1c:** Both N1a and N1b apply.

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

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

**N3:** Any of the following:

- **N3a:** either:
  - Cancer has spread to 10 or more axillary lymph nodes, and at least one area of cancer spread is greater than 2 mm.
  - Cancer has spread to the lymph nodes under the clavicle (collar bone), and at least one area of cancer spread is greater than 2 mm.
- **N3b:** either:
  - Cancer is found in at least one axillary lymph node (and at least one area of cancer spread is greater than 2 mm) and has enlarged the internal mammary lymph nodes.
  - Cancer was found in 4 or more axillary lymph nodes (and at least one area of cancer spread is greater than 2 mm), and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy.
- **N3c:** Cancer has spread to the lymph nodes above the clavicle and at least one area of cancer spread is greater than 2 mm.

## **M categories for breast cancer**

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

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

**M1:** Spread to distant organs is present. (The most common sites are bone, lung, brain, and liver.)

## **Breast cancer stage grouping**

Once the T, N, and M categories have been determined, this information is combined in a process called *stage grouping*. Cancers with similar stages tend to have a similar outlook and thus are often treated in a similar way. Stage is expressed in Roman numerals from stage I (the least advanced stage) to stage IV (the most advanced stage). Non-invasive cancer is listed as stage 0.

**Stage 0: Tis, N0, M0:** This is *ductal carcinoma in situ (DCIS)*, the earliest form of breast cancer. In DCIS, cancer cells are still within a duct and have not invaded deeper into the surrounding fatty breast tissue. Paget disease of the nipple (without an underlying tumor mass) is also stage 0. In all cases the cancer has not spread to lymph nodes or distant sites.

### **Stage I: Includes stages IA and IB**

**Stage IA: T1, N0, M0:** The tumor is 2 cm (about 3/4 of an inch) or less across and has not spread to lymph nodes or distant sites.

**Stage IB: T0 or T1, N1mi, M0:** The tumor is 2 cm or less across (or is not found) with micrometastases in 1 to 3 axillary lymph nodes (the cancer in the lymph nodes is greater than 0.2 mm across and/or more than 200 cells but is not larger than 2 mm). The cancer has not spread to distant sites.

### **Stage II: Includes stages IIA and IIB**

**Stage IIA:** One of the following applies:

**T0 or T1, N1 (but not N1mi), M0:** The tumor is 2 cm or less across (or is not found) (T1 or T0) and either:

- It has spread to 1 to 3 axillary lymph nodes (N1a), but not to distant sites (M0), OR
- Tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1b), but not in distant sites (M0), OR.
- It has spread to 1 to 3 axillary lymph nodes, and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1c), but not to distant sites (M0).

OR

**T2, N0, M0:** The tumor is larger than 2 cm across and less than 5 cm (T2), but it hasn't spread to the lymph nodes (N0) or to distant sites (M0).

**Stage IIB:** One of the following applies:

**T2, N1, M0:** The tumor is larger than 2 cm and less than 5 cm across (T2). It has spread to 1 to 3 axillary lymph nodes and/or tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1). It has not spread to distant sites (M0).

OR

**T3, N0, M0:** The tumor is larger than 5 cm across but does not grow into the chest wall or skin (T3). It has not spread to lymph nodes (N0) or to distant sites (M0).

**Stage III: Includes stages IIIA, IIB, and IIC**

**Stage IIIA:** One of the following applies

**T0 to T2, N2, M0:** The tumor is not more than 5 cm across (or cannot be found) (T0 to T2). It has spread to 4 to 9 axillary lymph nodes, or it has enlarged the internal mammary lymph nodes (N2). It has not spread to distant sites (M0).

OR

**T3, N1 to N2, M0:** The tumor is larger than 5 cm across but does not grow into the chest wall or skin (T3). It has spread to 1 to 9 axillary nodes, or to internal mammary nodes (N1 or N2). It has not spread to distant sites (M0)

**Stage IIB: T4, N0 to N2, M0:** The tumor has grown into the chest wall or skin (T4), and one of the following applies:

- It has not spread to the lymph nodes (N0).
- It has spread to 1 to 3 axillary lymph nodes and/or tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1).
- It has spread to 4 to 9 axillary lymph nodes, or it has enlarged the internal mammary lymph nodes (N2).

The cancer hasn't spread to distant sites (M0).

**Stage IIC: any T, N3, M0:** The tumor is any size (or can't be found) (any T), and one of the following applies:

- Cancer has spread to 10 or more axillary lymph nodes (N3).
- Cancer has spread to the lymph nodes under the clavicle (collar bone) (N3).
- Cancer has spread to the lymph nodes above the clavicle (N3).
- Cancer involves axillary lymph nodes and has enlarged the internal mammary lymph nodes (N3).
- Cancer involves 4 or more axillary lymph nodes, and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy.

The cancer hasn't spread to distant sites (M0).

**Stage IV: any T, any N, M1:** The cancer can be any size and may or may not have spread to nearby lymph nodes. It has spread to distant organs (the most common sites are the bone, liver, brain, or lung), or to lymph nodes far from the breast.

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

## Breast cancer in men survival rates by stage

Survival rates are often used by doctors as a standard way of discussing a person's prognosis (outlook). Some patients with breast cancer may want to know the survival statistics for people in similar situations. Others may not find the numbers helpful, or may even not want to know them. If you decide you don't want to know them, stop reading here and skip to the next section.

The 5-year survival rate refers to the percentage of patients who live at least 5 years after their cancer is diagnosed. Of course, many people live much longer than 5 years (and many are cured).

Five-year relative survival rates assume that some people will die of other causes and compare the observed survival with that expected for people without the cancer. This is a more accurate way to describe the impact of a particular type and stage of cancer on survival.

In order to get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Improvements in treatment since then may result in a more favorable outlook for men being diagnosed with breast cancer now.

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they cannot predict what will happen in any particular person's case. Many other factors can affect a person's outlook, such as their overall health, what treatment they receive, and how well the cancer responds to treatment. Your doctor can tell you how the numbers below may apply to you, as he or she is familiar with the aspects of your particular situation.

The numbers below come from the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) database. These statistics include only male breast cancer cases.

| Stage | 5-year relative survival rate |
|-------|-------------------------------|
| 0     | 100%                          |
| I     | 96%                           |

|     |     |
|-----|-----|
| II  | 84% |
| III | 52% |
| IV  | 24% |

## How is breast cancer in men treated?

*This information represents the views of the doctors and nurses serving on the American Cancer Society's Cancer Information Database Editorial Board. These views are based on their interpretation of studies published in medical journals, as well as their own professional experience.*

*The treatment information in this document is not official policy of the Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor.*

*Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.*

### General information about treatment

Most of the information about treating male breast cancer comes from doctors' experience with treating female breast cancer. Because so few men have breast cancer, it is hard for doctors to study the treatment of male breast cancer patients separately in clinical trials.

Treatments can be classified into broad groups, based on how they work and when they are used.

### Local versus systemic therapy

*Local therapy* is intended to treat a tumor at the site without affecting the rest of the body. Surgery and radiation therapy are examples of local therapies.

*Systemic therapy* refers to drugs, which can be given by mouth or directly into the bloodstream to reach cancer cells anywhere in the body. Chemotherapy, hormone therapy, and targeted therapy are systemic therapies.

### Adjuvant and neoadjuvant therapy

Patients who have no detectable cancer after surgery are often given treatment to help keep the cancer from coming back. This is known as *adjuvant therapy*. Doctors know that even in the early stages of breast cancer, cancer cells may break away from the main breast tumor and begin to spread. These cells can't be felt on a physical exam or seen on x-rays or other imaging tests, and they cause no symptoms. But they can become new tumors in nearby tissues and other organs (and bones). The goal of adjuvant therapy is to

kill these hidden cells. Both systemic therapy (like chemotherapy, hormone therapy, and targeted therapy) and radiation can be used as adjuvant therapy.

Not every patient needs adjuvant therapy. Whether or not you are likely to benefit from adjuvant therapy depends upon the stage and characteristics of your cancer and what type of surgery you had. Generally, if the tumor is larger or the cancer has spread to lymph nodes, it is more likely to have spread through the bloodstream, and you are more likely to see a benefit. But other features may determine whether or not a patient should be offered adjuvant therapy. Recommendations on adjuvant therapy are discussed in the sections on these treatments and in the section “Treating male breast cancer by stage.”

Some patients are given treatment, such as chemotherapy or hormone therapy, before surgery. The goal of this treatment is to shrink the tumor in the hope it will allow a less extensive operation to be done. This is called *neoadjuvant therapy*.

## Surgery for male breast cancer

For many, the thought of surgery can be frightening. But with a better understanding of what to expect before, during, and after the operation, many fears can be relieved. Depending on the likely extent of your surgery, you may be offered the choice of an outpatient procedure (you go home the same day) or admission to the hospital.

### What to expect

**Before surgery:** Usually, you meet with your surgeon a few days before the operation to talk about the procedure. This is a good time to ask specific questions about the surgery and review potential risks. Be sure you understand what the extent of the surgery is likely to be and what you should expect afterward.

You will be asked to sign a consent form, giving the doctor permission to perform the surgery. Take your time and review the form carefully to be certain that you understand what you are signing. Sometimes, doctors give you material to look at before your appointment, so you will have plenty of time to read it and won't feel rushed.

You may be asked to donate blood before an operation such as a mastectomy, if the doctor thinks you might need a transfusion during or after the operation. You might feel more secure knowing that if you do need a transfusion, you will get your own blood back. If you do not receive your own blood, it is important to know that in the United States, a blood transfusion from another person is nearly as safe as receiving your own blood. Ask your doctor about your possible need for a blood transfusion.

Your doctor will review your medical records and ask you about any medicines you are taking. This is to be sure that you are not taking anything that could interfere with the surgery. For example, if you are taking aspirin, arthritis medicine, or a blood-thinning medicine (like Coumadin), you may be asked to stop taking it about a week or two before the surgery. Be sure you tell your doctor about everything you take, including vitamins and herbal supplements. Usually, you will be told not to eat or drink anything for 8 to 12

hours before the surgery, especially if you are going to have general anesthesia (will be "asleep" during surgery).

You will also meet with the anesthesiologist or nurse anesthetist, the health professional who will give you the anesthesia during your surgery. The type of anesthesia used depends largely on the kind of surgery being done and your medical history.

**Surgery:** General anesthesia is usually given whenever the surgery is a mastectomy or an axillary node dissection, and is most often used during breast-conserving surgeries as well. You will have an IV (intravenous) line put in (usually into a vein in your arm), which the medical team will use to give medicines that may be needed during the surgery. Usually you will be hooked up to an electrocardiogram (EKG) machine and have a blood pressure cuff on your arm, so your heart rhythm and blood pressure can be checked during the surgery.

The length of the operation depends on the type of surgery being done. A mastectomy with axillary lymph node dissection often takes from 2 to 3 hours.

**What to expect after surgery:** After your surgery, you will be taken to the recovery room, where you will stay until you are awake and your condition and vital signs (blood pressure, pulse, and breathing) are stable.

How long you stay in the hospital depends on the surgery being performed, your overall state of health and whether you have any other medical problems, how well you do during surgery, and how you feel after surgery. Decisions about the length of your stay should be made by you and your doctor and not dictated by what your insurance will pay, but it is important to check your insurance coverage before surgery.

Often, men having a mastectomy and/or axillary lymph node dissection stay in the hospital for 1 or 2 nights and then go home. However, it is becoming more common for the surgery to be done as an outpatient, with a short-stay in an observation unit before going home. Your doctor might arrange for a home care nurse to visit you at home to monitor your progress and provide care.

You will have a dressing (bandage) over the surgery site that may or may not snugly wrap around your chest. You may have one or more drains (plastic or rubber tubes) coming out from the breast or underarm area to remove blood and lymph fluid that collects during the healing process. Your health care team will teach you how to care for the drains, which may include emptying and measuring the fluid and identifying problems the doctor or nurse needs to know about. Most drains stay in place for 1 or 2 weeks. When drainage has decreased to about 30 cc (1 fluid ounce) each day, the drain will usually be removed.

Doctors rarely put the arm in a sling to hold it in place. Most doctors will want you to start moving the arm soon after surgery so that it won't get stiff.

Discuss how to care for the surgery site and arm with your health care team. Written instructions about care after surgery are usually given to you and your caregivers. These instructions should include:

- The care of the surgical wound and dressing
- How to monitor drainage and take care of the drains
- How to recognize signs of infection
- When to call the doctor or nurse
- When to begin using the arm and how to do arm exercises to prevent stiffness
- What to eat and not to eat
- Use of medicines, including pain medicines and possibly antibiotics
- Any activity restrictions
- What to expect regarding sensations or numbness in the breast and arm
- When to see your doctor for a follow-up appointment

Most patients see their surgeon within 7 to 14 days after the surgery. Your surgeon should explain the results of your pathology report at this visit and talk to you about the need for further treatment. If you will need more treatment, you will be referred to a radiation oncologist and/or a medical oncologist.

## **Types of breast surgery**

Most men with breast cancer have some type of surgery. This usually involves an operation called a mastectomy. Many cancers may also require axillary (armpit) lymph node sampling and removal.

### **Mastectomy**

A mastectomy removes all of the breast tissue, sometimes along with other nearby tissues.

- In a *simple* or *total mastectomy*, the surgeon removes the entire breast, including the nipple, but does not remove underarm lymph nodes or muscle tissue from beneath the breast.
- In a *modified radical mastectomy*, the surgeon extends the incision to remove the entire breast and lymph nodes under the arm as well.
- If the tumor is large and growing into the chest muscles, the surgeon must do a *radical mastectomy*, a more extensive operation removing the entire breast, axillary lymph nodes, and the chest wall muscles under the breast. This is only needed if the cancer has grown into the pectoral muscles under the breast.

### **Breast-conserving surgery**

Breast-conserving surgery, such as a lumpectomy (removal of only the breast lump and a surrounding margin of normal tissue), is a treatment option for many women with breast

cancer. It is not used as often in men, mainly because the male breast has only a small amount of tissue beneath the nipple. Removing most male breast cancers requires removing almost all of the breast tissue. And because men have less breast tissue, male breast cancers are more likely to have reached the nipple or skin over the breast or the chest wall at an early stage, which requires more extensive surgery. But breast-conserving surgery may be an option in some cases if the tumor is not thought to have reached the nipple. If this type of surgery is done, it is typically followed by radiation therapy.

### **Possible side effects of breast surgery**

Aside from post-surgical pain, temporary swelling, and a change in the appearance of the breast, possible side effects of surgery include bleeding and infection at the surgical site, *hematoma* (buildup of blood in the wound), and *seroma* (buildup of clear fluid in the wound).

### **Lymph node surgery**

To determine if the breast cancer has spread to axillary (underarm) lymph nodes, one or more of these lymph nodes may be removed and looked at under the microscope. This is an important part of staging and determining treatment and outcomes. When the lymph nodes are affected, there is an increased likelihood that cancer cells have spread through the bloodstream to other parts of the body.

### **Axillary lymph node dissection (ALND)**

In this procedure, anywhere from about 10 to 40 (though usually less than 20) lymph nodes are removed from the axilla (the area under the arm) and checked for cancer spread. ALND is usually done at the same time as the mastectomy or lumpectomy, but it can be done in a second operation. This was once the most common way to check for breast cancer spread to nearby lymph nodes, and it is still done in some cases. For example, an ALND may be done if one or more of the underarm lymph nodes are known to contain cancer, based on a previous sentinel lymph node biopsy (see below).

### **Sentinel lymph node biopsy (SLNB)**

Although ALND is a safe operation and has low rates of most side effects, removing many lymph nodes increases the chance that the patient will have lymphedema after surgery (this is discussed below). To lower the risk of lymphedema, the doctors may use a sentinel lymph node biopsy (SLNB) procedure to check the lymph nodes for cancer. This procedure tells the doctor if cancer has spread to lymph nodes without removing as many of them first.

In this procedure the surgeon finds and removes the sentinel node (or nodes) — the first lymph node(s) into which a tumor drains, and the one(s) most likely to contain cancer cells if they have started to spread. To do this, the surgeon injects a radioactive substance and/or a blue dye into the area around the tumor, into the skin over the tumor, or into the tissues just under the areola (the colored area around the nipple). Lymphatic vessels will carry these substances into the sentinel node(s) over the next few hours. The doctor can

use a special device to detect the radioactivity in the nodes that the radioactive substance flows into or can look for lymph nodes that have turned blue. (These are separate ways to find the sentinel node, but are often done together as a double check.) The doctor then makes an incision (cut) in the skin over the area in the armpit and removes the nodes. These nodes (often 2 or 3) are then looked at by the pathologist.

The lymph node can sometimes be checked for cancer during surgery. If cancer is found in the sentinel lymph node, the surgeon may go on to do a full ALND. If no cancer cells are seen in the lymph node at the time of the surgery, or if the sentinel node is not checked at the time of the surgery, the lymph node(s) will be examined in greater detail over the next several days. If cancer is found in the lymph node, the surgeon may recommend a full ALND at a later time.

If there is no cancer in the sentinel node(s), it's very unlikely that the cancer has spread to other lymph nodes, so no further lymph node surgery is needed. The patient can avoid some of the potential side effects of a full ALND.

Until recently, if the sentinel node(s) contained cancer, the surgeon would do a full axillary lymph node dissection to see how many other lymph nodes were involved. A recent study has shown that this may not always be needed. In some cases, it may be just as safe to leave the rest of the lymph nodes behind. This is based on certain factors, such as the size of the tumor and what treatment is planned after surgery.

A sentinel lymph node biopsy is not always appropriate. If an underarm lymph node looks large or abnormal by touch or by ultrasound, it may be checked by fine needle aspiration. If cancer is found, a full ALND is recommended and a sentinel node biopsy is not needed.

Although this has become a common procedure, sentinel lymph node biopsy is a complex technique that requires a great deal of skill. It should be done only by a surgical team known to have experience with this technique. If you are thinking about having this type of biopsy, ask your health care team if this is something they do regularly.

**Possible side effects of lymph node surgery:** As with other operations, pain, swelling, bleeding, and infection are possible.

The main possible long-term effect of removing axillary lymph nodes is *lymphedema* (swelling) of the arm. This occurs because any excess fluid in the arms normally travels back into the bloodstream through the lymphatic system. Removing the lymph nodes sometimes blocks the drainage from the arm, causing this fluid to remain and build up.

This side effect has not been studied well in men, but in studies of women up to 30% of those who have a full ALND develop lymphedema. It also occurs in up to 3% of those who have a sentinel lymph node biopsy. Lymphedema seems to be more common if radiation is given after surgery. Sometimes the swelling lasts for only a few weeks and then goes away. Other times, the swelling lasts a long time. Ways to help prevent or reduce the effects of lymphedema are discussed in the section, "What happens after treatment for breast cancer in men?". If your arm is swollen, tight, or painful after lymph node surgery, be sure to tell someone on your cancer care team right away.

You may also have short- or long-term limitations in moving your arm and shoulder after surgery. This is more common after an ALND than a SLNB. Your doctor may give you exercises to ensure that you do not have permanent problems with movement (a frozen shoulder). Numbness of the skin of the upper, inner arm is another common side effect because the nerve that controls sensation here travels through the lymph node area.

Some patients notice a rope-like structure that begins under the arm and can extend down towards the elbow. This, sometimes called *axillary web syndrome* or *lymphatic cording*, is more common after an ALND than SLNB. Symptoms may not appear for weeks or even months after surgery. It can cause pain and limit movement of the arm and shoulder. This often goes away without treatment, although some patients seem to find physical therapy helpful.

## **Chronic pain after breast surgery**

Some patients have problems with nerve (neuropathic) pain in the chest wall, armpit, and/or arm after surgery that doesn't go away over time. This is called post-mastectomy pain syndrome (PMPS) because it was first described in women who had mastectomies, but it occurs after breast conserving therapy, as well. Studies have shown that between 20% and 30% of women develop symptoms of PMPS after surgery. It isn't clear how common this is in men after breast cancer surgery. The classic symptoms of PMPS are pain and tingling in the chest wall, armpit, and/or arm. Pain may also be felt in the shoulder or surgical scar. Other common complaints include numbness, shooting or pricking pain, or unbearable itching. Most patients with PMPS say that their symptoms are not severe.

PMPS is thought to be linked to damage done to the nerves in the armpit and chest during surgery. But the causes are not known. It seems to be more common in younger patients, those who had a full ALND (not just a SLNB), and those who were treated with radiation after surgery. Because ALNDs are done less often now, PMPS is less common than it once was.

It is important to talk to your doctor about any pain you are having. PMPS can cause you to not use your arm the way you should and over time you could lose the ability to use it normally.

PMPS can be treated. Although opioids or narcotics are medicines commonly used to treat pain, they don't always work well for nerve pain. But there are medicines and treatments that do work for this kind of pain. Talk to your doctor to get the pain control you need.

## **Radiation therapy for male breast cancer**

Radiation therapy uses high-energy rays or particles to destroy cancer cells. Radiation to the breast is often given after breast-conserving surgery to help lower the chance that the cancer will come back in the breast or nearby lymph nodes. This is needed less often in men with breast cancer than it is in women, mainly because breast-conserving surgery (such as lumpectomy) isn't done as much. Radiation may also be recommended after

mastectomy in patients with either a cancer larger than 5 cm (2 inches) in size, or when cancer is found in the lymph nodes.

Radiation is also used to treat cancer that has spread, such as to the bones or brain.

When given after surgery, radiation therapy is usually not started until the tissues have been able to heal for about a month. If chemotherapy is to be given as well, radiation therapy is usually delayed until chemotherapy is complete.

## **External beam radiation**

External beam radiation is the usual type of radiation therapy for men with breast cancer. The radiation is focused from a machine outside the body on the area affected by the cancer. This usually includes the chest wall where the breast was removed and, depending on the size and extent of the cancer, may include the underarm area, supraclavicular lymph nodes (nodes above the collarbone) and internal mammary lymph nodes (nodes beneath the breast bone in the center of the chest).

Before your treatments start, the radiation team will take careful measurements to determine the correct angles for aiming the radiation beams and the proper dose of radiation. They will make some ink marks or small tattoos on your skin that they will use later as a guide to focus the radiation on the right area. You may want to talk to your health care team to find out if these marks will be permanent.

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

The most common way breast radiation is given is 5 days a week (Monday thru Friday) for about 6 to 7 weeks. In studies of women with breast cancer, giving radiation over 3 weeks has been shown to be just as effective as giving it over 5 to 6 weeks. This, known as *hypofractionated radiation therapy*, has not been studied in men (because breast cancer is so rare in men).

## **Brachytherapy**

Brachytherapy, also known as *internal radiation*, is another way to deliver radiation therapy. Brachytherapy is rarely used to treat breast cancer in men because it is only used in someone who has had a lumpectomy. Instead of aiming radiation beams from outside the body, radioactive seeds or pellets are placed directly into the breast tissue next to the cancer. It is often used as a way to add an extra boost of radiation to the tumor site (along with external radiation to the whole breast), although it may also be used by itself (see below). Tumor size, location, and other factors may limit who can get brachytherapy. There are different types of brachytherapy.

**Intracavitary brachytherapy:** This method of brachytherapy consists of a small balloon attached to a thin tube. The deflated balloon is inserted into the space left by the lumpectomy and is filled with a salt water solution. (This can be done at the time of

lumpectomy or within several weeks afterward.) The balloon and tube are left in place throughout treatment (with the end of the tube sticking out of the breast). Twice a day a source of radioactivity is placed into the middle of the balloon through the tube and then removed. This is done for 5 days as an outpatient treatment. The balloon is then deflated and removed. This system goes by the brand name, Mammosite<sup>®</sup>. This type of brachytherapy can also be considered a form of *accelerated partial breast irradiation*. Like many forms of accelerated breast irradiation, there are no studies comparing outcomes with this type of radiation directly with standard external beam radiation. It is not known if the long-term outcomes will be as good.

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

## Possible side effects of radiation therapy

The main short-term side effects of radiation therapy are fatigue and sunburn-like skin changes. Your health care team may advise you to avoid exposing the treated skin to the sun because it may make the skin changes worse. Most skin changes go away in a few months.

Radiation to the breast/chest can sometimes damage some of the nerves to the arm. This, called *brachial plexopathy*, can lead to numbness, pain, and weakness in the shoulder, arm and hand.

Radiation therapy of the axilla (underarm area) can cause lymphedema (discussed earlier in “Types of breast surgery” in the “Surgery” section), particularly if the lymph nodes have been surgically removed. In rare cases, radiation therapy may weaken the ribs, which could lead to a fracture.

In rare cases, radiation therapy may weaken the ribs, which could lead to a fracture. In the past, parts of the lungs and heart were more likely to get some radiation, which could lead to long-term damage of these organs in some patients. Modern radiation therapy equipment allows doctors to better focus the radiation beams, so these problems are rare today.

A very rare complication of radiation to the breast is the development of another type of cancer called an *angiosarcoma*. These rare cancers can grow and spread quickly.

## Chemotherapy for male breast cancer

Chemotherapy (chemo) is treatment with cancer-fighting drugs that may be given intravenously (injected into a vein) or by mouth. The drugs travel through the bloodstream to reach cancer cells in most parts of the body. Chemo is given in cycles, with each period of treatment followed by a recovery period. Chemo usually is taken over several months.

## When is chemotherapy used?

There are different situations in which chemotherapy may be recommended.

**Adjuvant chemotherapy:** When therapy is given to patients who have no evidence of cancer after surgery, it is called adjuvant therapy. Although surgery is used to remove all of the cancer that can be seen, adjuvant therapy is used to kill any cancer cells that may have been left behind that can't be seen. Adjuvant therapy after surgery to remove breast cancer lowers the risk of breast cancer coming back.

Even in the early stages of the disease, cancer cells may break away from the primary breast tumor and spread through the bloodstream. These cells don't cause symptoms, they don't show up on imaging tests, and they can't be felt during a physical exam. But if they are allowed to grow, they can establish new tumors in other places in the body. The goal of adjuvant therapy is to kill undetected cells that have traveled from the breast. Radiation, chemo, and hormone therapy can all be used as adjuvant treatments

**Neoadjuvant chemotherapy:** Treatment given before surgery is called neoadjuvant therapy. Neoadjuvant therapy often uses the same chemo that is used as adjuvant therapy (only it is given before surgery instead of after). Giving these drugs before surgery seems to lower the chance that the cancer will come back and improve survival as much as giving them after surgery.

The major benefit of neoadjuvant chemo is that it can shrink large cancers so that they are more easily removed with surgery. The other advantage of neoadjuvant chemo is that doctors can see how the cancer responds to the chemo drugs. If the tumor does not shrink with the first set of drugs that are given, your doctor will know that other chemo drugs are needed.

In some cases, breast cancers are too big to be surgically removed at the time of diagnosis. These cancers are referred to as *locally advanced* and have to be treated with chemo to shrink them so they can be removed with surgery

**Chemotherapy for advanced breast cancer:** Chemotherapy can also be used as the main treatment for men whose cancer has already spread outside the breast and underarm area at the time it is diagnosed, or if it spreads after initial treatments. The length of treatment depends on whether the cancer shrinks, how much it shrinks, and how well a man tolerates treatment.

## How is chemotherapy given?

In most cases of adjuvant and neoadjuvant treatment, chemotherapy is most effective when combinations of drugs are used. There are many combinations in use, and it's not clear that any single combination is clearly the best. Clinical studies continue to compare today's most effective treatments against something that may be better.

Some of the most commonly used drug combinations for adjuvant chemotherapy are:

- CMF: cyclophosphamide (Cytoxan<sup>®</sup>), methotrexate, and 5-fluorouracil (Fluorouracil, 5-FU)
- CAF (FAC): cyclophosphamide, doxorubicin (Adriamycin<sup>®</sup>), and 5-fluorouracil
- AC: doxorubicin (Adriamycin) and cyclophosphamide
- EC: epirubicin (Ellence<sup>®</sup>) and cyclophosphamide
- TAC: docetaxel (Taxotere<sup>®</sup>), doxorubicin (Adriamycin), and cyclophosphamide
- AC → T: doxorubicin (Adriamycin) and cyclophosphamide followed by paclitaxel (Taxol<sup>®</sup>) or docetaxel (Taxotere). Trastuzumab (Herceptin) may be given with the paclitaxel or docetaxel for cancers that are HER2 positive (discussed later in detail).
- A → CMF: doxorubicin (Adriamycin), followed by CMF
- CEF (FEC): cyclophosphamide, epirubicin, and 5-fluorouracil (this may be followed by docetaxel)
- TC: docetaxel (Taxotere) and cyclophosphamide
- TCH: docetaxel, carboplatin, and trastuzumab (Herceptin)

Some other chemo drugs used for treating breast cancer metastases (when it has spread) include carboplatin, cisplatin, gemcitabine (Gemzar<sup>®</sup>), mitoxantrone, vinorelbine (Navelbine<sup>®</sup>), capecitabine (Xeloda<sup>®</sup>), pegylated liposomal doxorubicin (Doxil<sup>®</sup>), ixabepilone (Ixempra<sup>®</sup>), albumin-bound paclitaxel (Abraxane<sup>®</sup>), and eribulin (Halaven<sup>™</sup>). The targeted therapy drugs trastuzumab (Herceptin) and lapatinib (Tykerb) may be used with these chemo drugs (these drugs are discussed in more detail in the "Targeted therapy" section).

Some doctors recommend that chemo for metastatic breast cancer be given one drug at a time, whereas others recommend combinations of drugs. This decision will be based on how aggressively the cancer is growing and what chemo drugs (if any) have been given before for the cancer.

Doctors give chemo in cycles, with each period of treatment followed by a rest period. Chemo begins on the first day of each cycle, but the schedule varies depending on the drugs used. For example, with some drugs, the chemo is given only on the first day of the cycle. With others, it is given every day for 14 days, or weekly for 2 weeks. Then, at the end of the cycle, the schedule of chemo repeats to start the next cycle. Cycles are most often 2 or 3 weeks long, but they vary according to the specific drug or combination of drugs. Some drugs are given more often. Adjuvant chemo is often given for a total of 3 to 6 months, depending on what drugs are used. Treatment is often longer for advanced breast cancer, and is based on how well it is working and what side effects a man has.

**Dose-dense chemotherapy:** Doctors have found that giving the cycles of chemo closer together can lower the chance that the cancer will come back and improve survival in some patients. This usually means giving the same chemo that is normally given (such as AC → T), but giving it every 2 weeks instead of every 3 weeks. In addition, a drug

(growth factor) to help boost the white blood cell count is given after the chemo to make sure the white blood cell count returns to normal in time for the next cycle. This approach can lead to more side effects and be harder to take, so it is only used to treat patients who have a higher chance of the cancer coming back after treatment.

## **Possible side effects of chemotherapy**

Chemotherapy drugs work by attacking cells that are dividing quickly, which is why they work against cancer cells. But other cells in the body, such as those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are likely to be affected by chemotherapy too, which can lead to side effects. Some men have many side effects while other men may have few.

The side effects of chemotherapy depend on the type of drugs, the amount taken, and the length of treatment. Some of the most common possible side effects include:

- Hair loss
- Mouth sores
- Loss of appetite (or increased appetite)
- Nausea and vomiting
- Increased chance of infections (due to low white blood cell counts)
- Easy bruising or bleeding (due to low blood platelet counts)
- Fatigue (due to low red blood cell counts or other reasons)

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

Several other side effects are also possible. Some of these are only seen with certain chemotherapy drugs. Your cancer care team will give you information about the possible side effects of the specific drugs you are getting.

**Neuropathy:** Several drugs used to treat breast cancer, including the taxanes (docetaxel and paclitaxel), platinum agents (carboplatin, cisplatin), vinorelbine, erubulin, and ixabepilone, can damage nerves outside the brain and spinal cord. This can sometimes lead to symptoms (mainly in the hands and feet) such as numbness, pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. In most cases this goes away once treatment is stopped, but it may be long lasting in some men.

**Heart damage:** Adriamycin (doxorubicin), epirubicin (Ellence), and some other drugs may cause permanent heart damage (called *cardiomyopathy*). The risk of this occurring depends on how much of the drug is given, and is highest if the drug is used for a long time or in high doses. Doctors watch closely for this side effect. Most doctors check the patient's heart function (with a test like a MUGA or echocardiogram) before starting one

of these drugs. They also carefully control the doses and watch for symptoms of heart problems, and may repeat the heart test to monitor heart function during treatment. If the heart function begins to decline, treatment with these drugs is stopped. In some patients, heart damage takes a long time to develop. They may not show signs of poor heart function until months or years after treatment ends. Heart damage from these drugs happens more often if the targeted therapy drug trastuzumab is used as well, so doctors are more cautious when these drugs are used together.

**Hand-foot syndrome:** Certain chemo drugs, such as capecitabine and liposomal doxorubicin, can cause problems with irritation that affects the palms of the hands and the soles of the feet. This is called *hand-foot syndrome*. Early symptoms include numbness, tingling, and redness. If it gets worse, the hands and feet become swollen with discomfort or even pain. The skin may blister, leading to peeling of the skin. There is no specific treatment, but these symptoms gradually get better when the drug is stopped. The best way to prevent severe hand-foot syndrome is to tell your doctor when early symptoms come up, so that the drug dose can be changed. This syndrome can also occur when the drug 5-FU is given as an IV infusion over several days (which is not common in the treatment of breast cancer).

**Chemo brain:** Another possible side effect of chemotherapy is "chemo brain". Many women who get chemotherapy for breast cancer report a slight decrease in mental functioning. There may be some long-lasting problems with concentration and memory. Still, most women do function well after chemotherapy. In studies that have found chemo brain as a side effect of treatment, the symptoms most often go away within a few years. There is very little research on chemo brain in men, but there is no reason to expect any differences. For more information, see our document, *Chemo Brain*.

**Increased risk of leukemia:** Very rarely, certain chemotherapy drugs can permanently damage the bone marrow, leading to acute myeloid leukemia, a life-threatening cancer of white blood cells. When this happens it is usually within 10 years of treatment. In most men, chemotherapy's benefits of helping to prevent breast cancer from coming back or extending life are likely to far exceed the risk of this serious but rare complication.

**Feeling unwell or tired:** Many people do not feel as healthy after receiving chemotherapy as they did before. There is often a residual feeling of body pain or achiness and a mild loss of physical functioning. This is a very subtle change that is only revealed by closely questioning those who have had chemotherapy.

Fatigue is often another common (but often overlooked) problem for those who have had chemotherapy. This may last up to several years. It can often be helped, so it is important to let your doctor or nurse know about it. Exercise, naps, and conserving energy may be recommended. If there are problems with sleep, these can be treated. Sometimes there is depression, which may be helped by counseling and/or medicines.

## Hormone therapy for male breast cancer

Hormone therapy is another form of systemic therapy. Like chemotherapy, hormone therapy can be used as an adjuvant therapy to help reduce the risk of cancer recurrence

after surgery, and it can be used as neoadjuvant treatment as well. It is also used to treat cancer that has come back after treatment (recurred) or has spread.

Some breast cancers grow in response to the hormone estrogen. Estrogen is usually thought of as a "female" hormone, but men have it in their bodies as well, just at lower levels. About 9 out of 10 breast cancers in men have hormone receptors on the surface of their cells — that is — their cancers are estrogen receptor (ER)-positive and/or progesterone receptor (PR)-positive. This makes them more likely to respond to hormone treatments. Hormone therapy does not help patients whose tumors are both ER- and PR-negative.

Several approaches to blocking the effects of estrogen or lowering estrogen levels are used to treat breast cancer in women. Although many of these may work in men as well, doctors have the most experience with using anti-estrogen drugs, such as tamoxifen, in men.

For metastatic breast cancer, hormonal treatments are often used in a sequence. For example, tamoxifen may be tried first. If the cancer does not respond or if it grows back after it first responds, other hormonal treatments may be tried.

### **Tamoxifen and toremifene (Fareston®)**

These anti-estrogen drugs work by temporarily blocking estrogen receptors on breast cancer cells, preventing estrogen from binding to them and spurring their growth. They are taken daily as a pill.

For someone with hormone receptor-positive cancers, taking tamoxifen after surgery for 5 years reduces the chances of the cancer coming back by about half. Tamoxifen can also be used to treat metastatic breast cancer. Toremifene works like tamoxifen, but is not used as often and is only approved for patients with metastatic breast cancer.

The most common side effects include fatigue, hot flashes, and sexual problems. A rare but more serious side effect is blood clots, which usually form in deep veins of the leg (called *deep venous thrombosis* or DVT). In some cases, a piece of clot may break off and end up causing a blockage in the lungs (called a *pulmonary embolism* or PE). Your doctor or nurse should be called right away if you develop pain, redness, or swelling in your lower leg (calf), shortness of breath, or chest pain.

Tamoxifen has rarely been associated with strokes. These mostly have been seen in postmenopausal women, and the risk in men is not clear. Still, tell your doctor if you experience sudden severe headache, confusion, or trouble speaking or moving.

Tamoxifen may also increase the risk of heart attacks in some patients, however this link is not clear.

### **Aromatase inhibitors**

This group of drugs includes anastrozole (Arimidex®), letrozole (Femara®), and exemestane (Aromasin®). They block the production of small amounts of estrogen by the

adrenal glands. They are taken daily as pills. They have been found to be very effective in treating breast cancer in women, but they have not been well studied in men. Still, some doctors use them as the first line of hormone therapy instead of tamoxifen. Clinical trials are also looking at using aromatase inhibitors along with LHRH analogs (see next paragraph). The main side effects of these drugs are thinning of the bones and joint stiffness.

### **Fulvestrant (Faslodex®)**

Fulvestrant is a drug that also acts on the estrogen receptor, but instead of blocking it, this drug eliminates it. In women, this drug is often effective even if the breast cancer is no longer responding to tamoxifen. It has not been studied in men with breast cancer. It is given by injection once a month. Hot flashes, mild nausea, and fatigue are the major side effects. It is currently only approved by the Food and Drug Administration (FDA) for use in post-menopausal women with advanced breast cancer that no longer responds to tamoxifen or toremifene, but it may help men with breast cancer as well.

### **Luteinizing hormone-releasing hormone (LHRH) analogs and anti-androgens**

LHRH analogs such as leuprolide (Lupron®) and goserelin (Zoladex®) affect the pituitary gland and, stop the signal that the body sends to the testicles to make androgens. They cause androgen levels in the body to go down. They are given as shots either monthly or every few months. Anti-androgens such as flutamide and bicalutamide work by blocking the effect of male hormones on breast cancer cells. These drugs are taken daily as pills. LHRH analogs, either alone or with anti-androgens, are often effective in shrinking male breast cancers.

### **Megestrol**

Megestrol (Megace®) is a progesterone-like drug. It is unclear how it stops cancer cells from growing, but it appears to compete for hormone receptor sites in the cells. This is an older drug that is usually reserved for men who are no longer responding to other forms of hormone therapy. Megestrol may increase the risk for blood clots and frequently causes weight gain by increasing appetite.

### **Orchiectomy (castration)**

Surgical removal of the testicles greatly lowers the levels of testosterone and other androgens (male hormones) in the body. Most male breast cancers contain androgen receptors that may cause the cells to grow. Androgens can also be converted into estrogens in the body. Orchiectomy shrinks most male breast cancers, and may help other treatments like tamoxifen become more likely to work. This treatment was once quite common, but it is now used less often because of new non-surgical approaches to lowering androgen levels, such as the LHRH analogs discussed above.

## Possible side effects of hormone therapy

Although some of these drugs have unique side effects (see descriptions above), in general they can cause loss of sexual desire, trouble having an erection, weight gain, hot flashes, and mood swings. Be sure to discuss any such side effects with your cancer care team because there may be ways to treat them.

## Targeted therapy for male breast cancer

As researchers have learned more about the gene changes in cells that cause cancer, they have been able to develop newer drugs that specifically target these changes. These targeted drugs work differently from standard chemotherapy drugs. They often have different (and less severe) side effects. At this time, they are most often used along with chemotherapy.

### Drugs that target the HER2/neu protein

**Trastuzumab (Herceptin):** Trastuzumab is a type of drug known as a monoclonal antibody, a man-made version of a very specific immune system protein. It attaches to a growth-promoting protein known as HER2/neu (or just HER2), which is present in larger than normal amounts on the surface of the breast cancer cells in some patients. Breast cancers with too much of this protein tend to grow and spread more aggressively. Trastuzumab can help slow this growth and may also stimulate the immune system to more effectively attack the cancer.

Trastuzumab is given as an injection into a vein (IV), usually once a week or at a larger dosage once every 3 weeks. The optimal length of time to give it is not yet known, but it is often given for up to a year.

In women, trastuzumab is used (along with chemotherapy) as adjuvant therapy for HER2-positive cancers to reduce the risk of recurrence. Using trastuzumab along with chemotherapy has become standard adjuvant treatment for these cancers. This drug has not been tested as an adjuvant treatment in clinical trials in men (because there are too few men with breast cancer to study), but it may still be helpful for men with HER2-positive cancers.

Trastuzumab is also used to treat HER2-positive advanced breast cancers that return after chemotherapy or continue to grow during chemotherapy. Treatment that combines trastuzumab with chemotherapy may be more effective than chemotherapy alone in some patients. If a cancer gets worse while on trastuzumab and chemo, often the trastuzumab is continued and the chemo is changed.

Compared with chemotherapy drugs, the side effects of trastuzumab are relatively mild. These occur rarely and may include fever and chills, weakness, nausea, vomiting, cough, diarrhea, and headache. These side effects are less common after the first dose.

A more serious potential side effect is heart damage leading to a problem called congestive heart failure. For most (but not all) people, this effect is temporary and

improves when the drug is stopped. The risk of heart problems is higher when trastuzumab is given with certain chemotherapy drugs such as doxorubicin (Adriamycin) or epirubicin (Ellence). For this reason heart function is checked regularly during treatment with trastuzumab. Major symptoms are leg swelling, shortness of breath, and severe fatigue. People having these symptoms should call their doctor right away.

**Lapatinib (Tykerb):** Lapatinib is another drug that targets the HER2 protein. This drug is given as a pill, most often along with the chemotherapy drug capecitabine (Xeloda). It is used to treat advanced, HER2-positive breast cancer that is no longer helped by chemotherapy and trastuzumab. It is also being studied as an adjuvant therapy in HER2-positive patients, but at this time is only used for advanced breast cancer. It is often given with chemo, but may be given alone or with trastuzumab.

The most common side effects with this drug include diarrhea, rash, and hand-foot syndrome (hand-foot syndrome was discussed in the section “Chemotherapy”). Diarrhea is a common side effect and can be severe, so it is very important to let your health care team know about any changes in bowel habits as soon as they happen. In rare cases lapatinib may cause liver problems or a decrease in heart function (that can lead to shortness of breath), but this seems to go away once treatment is finished.

## **Bevacizumab (Avastin®)**

Tumors need to develop and maintain new blood vessels in order to grow. This process is called *angiogenesis*. Drugs that target these blood vessels (anti-angiogenesis drugs) are helpful against a variety of cancers and have been studied in the treatment of breast cancer.

Bevacizumab is a monoclonal antibody that may be used in patients with metastatic breast cancer. This antibody is directed against vascular endothelial growth factor (VEGF), a protein that helps tumors form new blood vessels. Bevacizumab is given by intravenous (IV) infusion. It is most often used in combination with chemo.

Rare, but possibly serious side effects include bleeding, holes forming in the colon (requiring surgery to correct), and slow wound healing. More common side effects include high blood pressure, tiredness, blood clots, low white blood cell counts, headaches, mouth sores, loss of appetite, and diarrhea. High blood pressure is very common, so it is very important that your doctor watches your blood pressure carefully during treatment.

Bevacizumab was first approved by the FDA as part of the treatment for metastatic breast cancer in 2008. The approval was based on a study in which the patients that received bevacizumab with the chemo drug paclitaxel (Taxol) had a longer time without their cancers growing than those who received the chemo drug alone.

New study results that were presented at a FDA meeting in July 2010, did not show a real benefit for the patients receiving bevacizumab as a part of their treatment. Although bevacizumab seemed to slow cancer growth for a short-time in some of the patients, it didn't help them live longer. Those given bevacizumab also had much more severe side

effects. The FDA concluded that in the treatment of metastatic breast cancer, the risks of this drug outweigh the benefits.

On November 18, 2011, the FDA removed the breast cancer "indication" for bevacizumab. This does not cause the drug to be removed from the market or become unavailable, as it is FDA-approved for the treatment of some other cancers. It does mean that the company making bevacizumab can't market the drug for breast cancer — the company can't tell doctors or patients that the drug is useful in treating breast cancer. At this time, patients who are taking bevacizumab can continue to do so, but they should discuss this treatment with their doctors.

## Bisphosphonates for male breast cancer

Bisphosphonates are drugs that are used to help strengthen bones and, reduce the risk of fractures, and pain in bones that have been weakened by metastatic breast cancer. The most common bisphosphonates used in breast cancer patients are pamidronate (Aredia<sup>®</sup>) and zoledronic acid (Zometa<sup>®</sup>). They are given intravenously (IV).

Bisphosphonates may also help against bone thinning (osteoporosis) that can result from treatment with aromatase inhibitors and LHRH analogs (see the "Hormone therapy" section). There are a number of medicines, including some oral forms of bisphosphonates, to treat loss of bone strength when it is not caused by cancer spread to the bones.

Bisphosphonates can have side effects, including flu-like symptoms and bone pain. They can also lead to kidney problems, so patients with poor kidney function may not be able to be treated with these drugs.

A rare but very distressing side effect of bisphosphonates is damage (osteonecrosis) in the jaw bones or ONJ. It can be triggered by having a tooth removed while getting treated with the bisphosphonate. ONJ often appears as an open sore in the jaw that won't heal. It can lead to loss of teeth or infections of the jaw bone.

Doctors don't know why this happens or how to treat it, other than to stop the bisphosphonates. Maintaining good oral hygiene by flossing, brushing, making sure that dentures fit properly, and having regular dental checkups may help prevent this. Most cancer doctors recommend that patients have a dental checkup and have any tooth or jaw problems treated before they start taking a bisphosphonate.

## Denosumab for male breast cancer

A newer drug called *denosumab* (Xgeva<sup>™</sup>, Prolia<sup>™</sup>) is also now available to help lower the risk of fractures and other problems caused by breast cancer that has spread to the bone. It works differently from bisphosphonates. In studies of patients with breast cancer that had spread to the bone, it seemed to help prevent problems like fractures (breaks) better than zoledronic acid (Zometa). It also can help even after bisphosphonates stop working.

To treat cancer spread to bones, this drug is given as an injection under the skin every 4 weeks. Side effects include low blood levels of calcium and phosphate, as well as the jaw bone problem known as *osteonecrosis of the jaw*. This drug does not seem to affect the kidneys, so it is safe to give in patients with kidney problems.

Denosumab can also be used to make weak bones stronger in patients who are given treatments that lower androgen levels. When given for this purpose, denosumab is given less often (usually every 6 months).

## High-dose chemotherapy with peripheral blood stem cell or bone marrow transplant for male breast cancer

It is possible to use very high doses of chemotherapy or radiation to kill cancer cells, but these treatments also kill the blood-making stem cells in the bone marrow. Damage to these cells lowers a person's blood cell count. Having too few white blood cells can lead to severe infections that could be fatal. A person can bleed easily if they have too few platelets. This, too, can be fatal.

One way to get around this is to remove some of the patient's stem cells from either the peripheral (circulating) blood or the bone marrow, give the high-dose treatment, and then return the stem cells to the body through a blood transfusion. The stem cells are able to find their way back into the bone marrow, where they soon re-establish themselves and restore the body's ability to make new blood cells.

At one time it was thought that this would be a good way to treat people with advanced breast cancer. However, several studies found that women who received high-dose chemotherapy did not live any longer than women who received standard chemotherapy without a stem cell transplant. High-dose chemotherapy with stem cell support also caused more serious side effects than standard dose chemotherapy. A single small study in men had results similar to those obtained in women.

At this time, This is not a standard treatment for breast cancer and most experts recommend that this only be used in the treatment of breast cancer as part of a clinical trial.

## Clinical trials for male breast cancer

You may have had to make a lot of decisions since you've been told you have cancer. One of the most important decisions you will make is choosing which treatment is best for you. You may have heard about clinical trials being done for your type of cancer. Or maybe someone on your health care team has mentioned a clinical trial to you.

Clinical trials are carefully controlled research studies that are done with patients who volunteer for them. They are done to get a closer look at promising new treatments or procedures.

If you would like to take part in a clinical trial, you should start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials

matching service for a list of clinical trials that meet your medical needs. You can reach this service at 1-800-303-5691 or on our Web site at [www.cancer.org/clinicaltrials](http://www.cancer.org/clinicaltrials). You can also get a list of current clinical trials by calling the National Cancer Institute's Cancer Information Service toll-free at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials Web site at [www.cancer.gov](http://www.cancer.gov).

There are requirements you must meet to take part in any clinical trial. If you do qualify for a clinical trial, it is up to you whether or not to enter (enroll in) it.

Clinical trials are one way to get state-of-the-art cancer treatment. They are the only way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

You can get a lot more information on clinical trials in our document called *Clinical Trials: What You Need to Know*. You can read it on our Web site or call our toll-free number (1-800-227-2345) and have it sent to you.

## Complementary and alternative therapies for male breast cancer

When you have cancer you are likely to hear about ways to treat your cancer or relieve symptoms that your doctor hasn't mentioned. Everyone from friends and family to Internet groups and Web sites offer ideas for what might help you. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

### **What exactly are complementary and alternative therapies?**

Not everyone uses these terms the same way, and they are used to refer to many different methods, so it can be confusing. We use *complementary* to refer to treatments that are used *along with* your regular medical care. *Alternative* treatments are used *instead of* a doctor's medical treatment.

**Complementary methods:** Most complementary treatment methods are not offered as cures for cancer. Mainly, they are used to help you feel better. Some methods that are used along with regular treatment are meditation to reduce stress, acupuncture to help relieve pain, or peppermint tea to relieve nausea. Some complementary methods are known to help, while others have not been tested. Some have been proven not to be helpful, and a few have even been found harmful.

**Alternative treatments:** Alternative treatments may be offered as cancer cures. These treatments have not been proven safe and effective in clinical trials. Some of these methods may pose danger, or have life-threatening side effects. But the biggest danger in most cases is that you may lose the chance to be helped by standard medical treatment. Delays or interruptions in your medical treatments may give the cancer more time to grow and make it less likely that treatment will help.

## **Finding out more**

It is easy to see why people with cancer think about alternative methods. You want to do all you can to fight the cancer, and the idea of a treatment with no side effects sounds great. Sometimes medical treatments like chemotherapy can be hard to take, or they may no longer be working. But the truth is that most of these alternative methods have not been tested and proven to work in treating cancer.

As you consider your options, here are 3 important steps you can take:

- Look for "red flags" that suggest fraud. Does the method promise to cure all or most cancers? Are you told not to have regular medical treatments? Is the treatment a "secret" that requires you to visit certain providers or travel to another country?
- Talk to your doctor or nurse about any method you are thinking about using.
- Contact us at 1-800-ACS-2345 to learn more about complementary and alternative methods in general and to find out about the specific methods you are looking at.

## **The choice is yours**

Decisions about how to treat or manage your cancer are always yours to make. If you want to use a non-standard treatment, learn all you can about the method and talk to your doctor about it. With good information and the support of your health care team, you may be able to safely use the methods that can help you while avoiding those that could be harmful.

## **Treating male breast cancer by stage**

Because there have been few clinical trials on treatment of male breast cancer, most doctors base their treatment recommendations on their personal experience with the disease and on the results of studies of breast cancer in women. With some minor variations, breast cancer in men is treated in a similar way to breast cancer in women.

### **Stage I**

These cancers are still relatively small and either have not spread to the lymph nodes (N0) or there is a tiny area of cancer spread in the sentinel lymph node (N1mi).

The main treatment for stage I breast cancer is surgical removal of the cancer. Although this is usually done by mastectomy, breast-conserving surgery such as a lumpectomy may also be an option. But because there is very little breast tissue in men, usually the whole breast (including the nipple) needs to be removed. If breast-conserving surgery is done, it is usually followed by radiation therapy.

The lymph nodes under the arm will be checked for cancer spread, either with an axillary lymph node dissection (ALND) or sentinel node biopsy (SLNB). If the sentinel lymph

node contains cancer, a full ALND may be needed, depending on the size of the cancer in the lymph node as well as what other treatment is planned.

Hormone therapy and/or chemotherapy may be recommended after surgery (adjuvant therapy), based on the tumor size and results of lab tests. Adjuvant hormone therapy is usually suggested for hormone receptor-positive tumors. Adjuvant chemotherapy (chemo) is commonly used for tumors larger than 1 cm (about 1/2 inch) across and some smaller tumors that may be more likely to spread (based on features such as grade or a high growth rate). Men with HER2-positive tumors may also receive trastuzumab (Herceptin).

## **Stage II**

These cancers are larger and/or have spread to a few nearby lymph nodes. As with stage I cancers, mastectomy is usually the preferred treatment option. Radiation therapy may be given after surgery if the tumor is large or if it is found to have spread to several lymph nodes. Radiation therapy lowers the risk of the cancer coming back later.

Adjuvant hormone therapy is usually suggested for hormone receptor-positive tumors. Adjuvant chemo may be also recommended. Choices about chemotherapy may be influenced by a man's age and general state of health. Men with HER2-positive cancer will probably also receive trastuzumab.

## **Stage III**

This stage includes more advanced tumors (large or with growth into nearby skin or muscle) and cancers with more lymph node involvement (either more underarm lymph nodes containing cancer or lymph nodes inside the chest containing cancer).

This stage is treated with surgery, usually mastectomy. SLNB may be done initially, but most patients with this stage need a full ALND. Radiation therapy is usually recommended after surgery. Adjuvant hormone therapy (if the tumor is estrogen- or progesterone-receptor positive) and chemo are usually recommended as well. Men with HER2-positive cancers will probably also receive trastuzumab.

Another option is to treat first with chemo and or hormone therapy before surgery (neoadjuvant therapy) to try to shrink the tumor. This is followed with mastectomy and ALND. Radiation is often given after surgery. Hormone therapy is given as well, if the cancer is hormone receptor-positive (estrogen- or progesterone-receptor). Additional chemo may also be given after surgery, depending on what was given before surgery and how well the tumor responded.

## **Stage IV**

Stage IV cancers have spread beyond the breast and nearby lymph nodes to other parts of the body. Breast cancer most commonly spreads to the bones, liver, and lungs. As the cancer progresses, it may spread to the brain, but it can affect any organ and tissue, even the eyes.

While surgery and/or radiation may be useful in some situations (see below), systemic therapy is the main treatment. Depending on many factors, this may be hormone therapy, chemotherapy, targeted therapy such as trastuzumab (Herceptin) or lapatinib (Tykerb), or some combination of these treatments.

All of the systemic therapies given for breast cancer — hormone therapy, chemotherapy, and targeted therapies — have potential side effects, which were described in previous sections. Your doctor will explain to you the benefits and risks of these treatments before prescribing them.

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

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

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

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

Treatment to relieve symptoms depends on where the cancer has spread. For example, pain resulting from bone metastases may be treated with external beam radiation therapy and/or bisphosphonates or denosumab (Xgeva). Most doctors recommend bisphosphonates or denosumab along with calcium and vitamin D for all patients whose breast cancer has spread to their bones. (For more information about treatment of bone metastases, see our document, *Bone Metastasis*.)

**Advanced cancer that progresses during treatment:** Treatment for advanced breast cancer can often shrink or slow the growth of the cancer (sometimes for many years), but after a time it may stop working. Further treatment at this point depends on several factors, including previous treatments, where the cancer is located, and a man's age, general health, and desire to continue getting treatment.

For hormone receptor-positive cancers that were being treated with hormone therapy, switching to another type of hormone therapy is sometimes helpful. If not, chemotherapy is usually the next step.

For cancers that are no longer responding to one chemotherapy regimen, trying another may be helpful. Many different drugs and combinations can be used to treat breast

cancer. However, each time a cancer progresses during treatment it becomes less likely that further treatment will have an effect.

HER2-positive cancers that no longer respond to trastuzumab may respond if lapatinib (Tykerb) is added. Lapatinib also attacks the HER2 protein. This drug is usually given along with the chemo drug capecitabine (Xeloda), but it may be used with other chemo drugs or even alone (without chemo).

Because current treatments are very unlikely to cure advanced breast cancer, patients in otherwise good health are encouraged to think about taking part in clinical trials of other promising treatments.

## **Recurrent cancer**

Cancer is called recurrent when it come backs after treatment. Recurrence can be local (in or near the same place it started) or distant (spread to organs such as the lungs or bones). Rarely, breast cancer comes back in nearby lymph nodes. This is called *regional* recurrence.

**Local recurrence:** This includes cancer coming back in the breast or in the chest wall (near the mastectomy scar). If a patient has a local recurrence and no evidence of distant metastases, cure may still be possible. Treatment depends on what other treatments have already been given. If the initial treatment was mastectomy, recurrence is treated by removing the tumor whenever possible. This may be followed by radiation therapy. If the area has already been treated with radiation, it may not be possible to give more radiation to the area without severely damaging nearby normal tissues.

Hormone therapy, chemotherapy, trastuzumab, or some combination of these may be used after surgery and/or radiation therapy.

**Regional recurrence:** When breast cancer comes back as spread to nearby lymph nodes (such as those under the arm or around the collar bone), it is treated by removing those lymph nodes. This may be followed by radiation treatments aimed at the area.

Hormone therapy, chemotherapy, trastuzumab, or some combination of these may be used after surgery and/or radiation therapy.

**Distant recurrence:** In general, men who have a recurrence in organs such as the bones, lungs, brain, etc., are treated the same way as those found to have stage IV breast cancer in these organs at the time of initial diagnosis (see above). The only difference is that treatment may be affected by the previous treatments a man has had.

Should your cancer come back, our document, *When Your Cancer Comes Back: Cancer Recurrence* can provide you with more general information on how to manage and cope with this phase of your treatment.

## More treatment information

For more details on treatment options -- including some that may not be addressed in this document -- the National Cancer Institute (NCI) is a good source of information.

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its Web site ([www.cancer.gov](http://www.cancer.gov)). Detailed guidelines intended for use by cancer care professionals are also available on this Web site.

## What should you ask your doctor about breast cancer in men?

It is important for you to have frank, open discussions with your cancer care team. You should ask questions, no matter how minor you think they are. Some questions to consider:

- What type of breast cancer do I have? Does this affect my treatment options and prognosis (outlook)?
- Has my cancer spread to lymph nodes or internal organs?
- What is the stage of my cancer and what does that mean in my case?
- Are there other tests that need to be done before we can decide on treatment?
- What treatments are appropriate for me? What do you recommend? Why?
- How long will treatment last? What will it involve? Where will it be done?
- What are the risks or side effects that I should expect?
- Should I think about taking part in a clinical trial?
- What should I do to get ready for treatment?
- What are the chances my cancer might come back with the treatment programs we have discussed? What would we do if that happens?
- What is my expected prognosis, based on my cancer as you view it?
- What type of follow-up will I need after treatment?

Be sure to write down any questions you have that are not on this list. For instance, you might want information about recovery times so that you can plan your work schedule. Or you may want to ask about second opinions.

# What happens after treatment for breast cancer in men?

For many men with breast cancer, treatment may remove or destroy the cancer. Completing treatment can be both stressful and exciting. You may be relieved to finish treatment, but find it hard not to worry about cancer coming back. (When cancer comes back after treatment, it is called *recurrence*.) This is a very common concern in people who have had cancer.

It may take a while before your fears lessen. But it may help to know that many cancer survivors have learned to live with this uncertainty and are leading full lives. Our document, *Living With Uncertainty: The Fear of Cancer Recurrence* gives more detailed information on this.

For other people, the cancer may never go away completely. These people may get regular treatments with chemotherapy, radiation therapy, or other therapies to try to help keep the cancer in check. Learning to live with cancer that does not go away can be difficult and very stressful. It has its own type of uncertainty. Our document, *When Cancer Doesn't Go Away*, talks more about this.

## Follow-up care

When treatment ends, your doctors will still want to watch you closely. It is very important to go to all of your follow-up appointments. During these visits, your doctors will ask questions about any problems you may have and may do exams and lab tests or x-rays and scans to look for signs of cancer or signs of treatment side effects. Almost any cancer treatment can have side effects. Some may last for a few weeks to months, but others can last the rest of your life. Now is the time for you to talk to your cancer care team about any changes or problems you notice and any questions or concerns you have.

At first, your follow-up appointments will probably be scheduled for every 3 to 6 months. The longer you have been free of cancer, the less often the appointments are needed. After 5 years, they are typically done about once a year.

Mammograms of your opposite breast will be recommended yearly and the breast that had the cancer will be evaluated as well with a mammogram if it has not been completely removed by a mastectomy.

If you are taking an aromatase inhibitor or a luteinizing hormone-releasing hormone (LHRH) analog, you may be at increased risk for osteoporosis (thinning of the bones). Your doctor may want to monitor your bone health and may consider testing your bone density.

Other tests such as blood tumor marker studies, blood tests of liver function, bone scans, and chest x-rays are not a standard part of follow-up. Getting these tests doesn't help someone treated with breast cancer live longer. They will be done (as indicated) if you

have symptoms or physical exam findings that suggest that the cancer has recurred. These and other tests may be done as part of evaluating new treatments by clinical trials.

If symptoms, exams, or tests suggest cancer may have recurred, imaging tests such as a chest x-ray, CT scan, PET scan, MRI scan, bone scan, and/or a biopsy may be done. Your doctor may also measure levels of blood tumor markers such as CA15-3 or CA27-29. The blood levels of these substances go up in some men if their cancer has spread to bones or other organs such as the liver. They are not elevated in everyone with recurrence, so they aren't always helpful. If they are elevated, they may help your doctor monitor the results of therapy.

If cancer does recur, treatment will depend on the location of the cancer and what treatments you've had before. It may include surgery, radiation therapy, hormone therapy, chemotherapy, targeted therapy, or some combination of these. For more information on how recurrent cancer is treated, see "Recurrent cancer" in the section "Treating male breast cancer by stage." For more general information on dealing with a recurrence, you may also want to see our document, *When Your Cancer Comes Back: Cancer Recurrence*.

It is also important to keep health insurance. Tests and doctor visits cost a lot, and even though no one wants to think of their cancer coming back, this could happen.

## **Lymphedema**

Lymphedema, or swelling of the arm due to buildup of fluid, may occur any time after treatment for breast cancer. Any treatment that involves removing axillary lymph nodes or treating them with radiation carries the risk of lymphedema because normal drainage of lymph fluid from the arm is changed.

One of the first symptoms of lymphedema may be a feeling of tightness in the arm or hand on the same side that was treated for breast cancer. Any swelling, tightness, or injury to the arm or hand should be reported promptly to your doctor or nurse.

There is no good way to predict who will and will not develop lymphedema. It can occur right after surgery, or months, or even years later. The possibility of developing lymphedema remains throughout a man's lifetime.

With care, lymphedema can often be avoided or, if it develops, kept under control. Injury or infection involving the affected arm or hand can contribute to the development of lymphedema or make existing lymphedema worse, so preventive measures should focus on protecting the arm and hand. Most doctors recommend that men avoid having blood drawn from or blood pressures taken on the arm on the side of the lymph node surgery or radiation.

To learn more, see our document, *Lymphedema: What Every Woman With Breast Cancer Should Know* (the information also applies to men).

## Seeing a new doctor

At some point after your cancer diagnosis and treatment, you may find yourself seeing a new doctor who does not know anything about your medical history. It is important that you be able to give your new doctor the exact details of your diagnosis and treatment. Make sure you have this information handy:

- A copy of your pathology report(s) from any biopsies or surgeries
- If you had surgery, a copy of your operative report(s)
- If you were in the hospital, a copy of the discharge summary that doctors prepare when patients are sent home
- If you had radiation therapy, copy of the treatment summary
- If you had systemic therapy (hormone therapy, chemotherapy, or targeted therapies), a list of your drugs, drug doses, and when you took them
- Copies of your x-rays and other imaging studies (these can be put on a DVD)

The doctor might want copies of this information for his records, but always be sure to keep copies for yourself.

## Lifestyle changes

You can't change the fact that you have had cancer. What you can change is how you live the rest of your life – making choices to help you stay healthy and feel as well as you can. This can be a time to look at your life in new ways. Maybe you are thinking about how to improve your health over the long term. Some people even start during cancer treatment.

## Making healthier choices

For many people, a diagnosis of cancer helps them focus on their health in ways they may not have thought much about in the past. Are there things you could do that might make you healthier? Maybe you could try to eat better or get more exercise. Maybe you could cut down on the alcohol, or give up tobacco. Even things like keeping your stress level under control may help. Now is a good time to think about making changes that can have positive effects for the rest of your life. You will feel better and you will also be healthier.

You can start by working on those things that worry you most. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call the American Cancer Society for information and support. This tobacco cessation and coaching service can help increase your chances of quitting for good.

## **Eating better**

Eating right can be hard for anyone, but it can get even tougher during and after cancer treatment. Treatment may change your sense of taste. Nausea can be a problem. You may not feel like eating and lose weight when you don't want to. Or you may have gained weight that you can't seem to lose. All of these things can be very frustrating.

If treatment caused weight changes or eating or taste problems, do the best you can and keep in mind that these problems usually get better over time. You may find it helps to eat small portions every 2 to 3 hours until you feel better. You may also want to ask your cancer team about seeing a dietitian, an expert in nutrition who can give you ideas on how to deal with these treatment side effects.

One of the best things you can do after cancer treatment is put healthy eating habits into place. You may be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Getting to and staying at a healthy weight, eating a healthy diet, and limiting your alcohol intake may lower your risk for a number of types of cancer, as well as having many other health benefits.

## **Rest, fatigue, and exercise**

Extreme tiredness, called *fatigue*, is very common in people treated for cancer. This is not a normal tiredness, but a "bone-weary" exhaustion that doesn't get better with rest. For some people, fatigue lasts a long time after treatment, and can make it hard for them to exercise and do other things they want to do. But exercise can help reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel better physically and emotionally and can cope better, too.

If you were sick and not very active during treatment, it is normal for your fitness, endurance, and muscle strength to decline. Any plan for physical activity should fit your own situation. An older person who has never exercised will not be able to take on the same amount of exercise as a 20-year-old who plays tennis twice a week. If you haven't exercised in a few years, you will have to start slowly – maybe just by taking short walks.

Talk with your health care team before starting anything. Get their opinion about your exercise plans. Then, try to find an exercise buddy so you're not doing it alone. Having family or friends involved when starting a new exercise program can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, you will need to balance activity with rest. It is OK to rest when you need to. Sometimes it's really hard for people to allow themselves to rest when they are used to working all day or taking care of a household, but this is not the time to push yourself too hard. Listen to your body and rest when you need to. (For more information on dealing with fatigue, please see *Fatigue in People With Cancer* and *Anemia in People With Cancer*.)

Keep in mind exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.

- Along with a good diet, it will help you get to and stay at a healthy weight.
- It makes your muscles stronger.
- It reduces fatigue and helps you have more energy.
- It can help lower anxiety and depression.
- It can make you feel happier.
- It helps you feel better about yourself.

And long term, we know that getting regular physical activity plays a role in helping to lower the risk of some cancers, as well as having other health benefits.

## How about your emotional health?

Once your treatment ends, you may find yourself overcome with many different emotions. This happens to a lot of people. You may have been going through so much during treatment that you could only focus on getting through each day. Now it may feel like a lot of other issues are catching up with you.

You may find yourself thinking about death and dying. Or maybe you're more aware of the effect the cancer has on your family, friends, and career. You may take a new look at your relationship with your spouse or partner. Unexpected issues may also cause concern. For instance, as you feel better and have fewer doctor visits, you will see your health care team less often and have more time on your hands. These changes can make some people anxious.

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

The cancer journey can feel very lonely. It is not necessary or good for you to try to deal with everything on your own. And your friends and family may feel shut out if you do not include them. Let them in, and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-227-2345 and we can put you in touch with a group or resource that may work for you.

## If treatment stops working

If cancer keeps growing or comes back after one kind of treatment, it is possible that another treatment plan might still cure the cancer, or at least shrink it enough to help you live longer and feel better. But when a person has tried many different treatments and the cancer has not gotten any better, the cancer tends to become resistant to all treatment. If this happens, it's important to weigh the possible limited benefits of a new treatment against the possible downsides. Everyone has their own way of looking at this.

This is likely to be the hardest part of your battle with cancer -- when you have been through every medical treatment the doctors offer you and nothing's working anymore. Your doctor may offer you new options, but at some point you need to consider that treatment is not likely to improve your health or change your outcome or survival.

If you want to continue to get treatment as long as you can, you still need to think about the odds of treatment having any benefit. In many cases, your doctor can estimate how likely it is the cancer will respond to treatment you are considering. For instance, the doctors may say that more chemo or radiation might have about a 1% chance of working. Some people are still tempted to try this. But it is important to think about and understand your reasons for choosing this plan.

No matter what you decide to do, you need to feel as good as you can. Make sure you are asking for and getting treatment for any symptoms you might have, such as nausea or pain. This type of treatment is called *palliative treatment*.

Palliative treatment helps relieve symptoms, but is not expected to cure the disease. It can be given along with cancer treatment, or can even be cancer treatment. The difference is its purpose - the main purpose of palliative care is to improve the quality of your life, or help you feel as good as you can for as long as you can. Sometimes this means using drugs to help with symptoms like pain or nausea. Sometimes, though, the treatments used to control your symptoms are the same as those used to treat cancer. For instance, radiation might be used to help relieve bone pain caused by cancer that has spread to the bones. Or chemo might be used to help shrink a tumor and keep it from blocking the bowels. But this is not the same as treatment to try to cure the cancer.

At some point, you may benefit from hospice care. This is special care that treats the person rather than the disease; it focuses on quality rather than length of life. Most of the time, it is given at home. Your cancer may be causing problems that need to be managed, and hospice focuses on your comfort. You should know that getting hospice care doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. It just means that the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult time. You can learn more about hospice in our document called *Hospice Care*.

Staying hopeful is important, too. Your hope for a cure may not be as bright, but there is still hope for good times — times that are filled with happiness and meaning — with family and friends. Pausing at this time in your cancer treatment gives you a chance to refocus on the most important things in your life. This is the time to do some things

you've always wanted to do and to stop doing the things you no longer want to do. Though the cancer may be beyond your control, there are still choices you can make.

## **What's new in research and treatment in male breast cancer?**

Research into the causes, prevention, and treatment of breast cancer is under way in many medical centers throughout the world. Our document, *Breast Cancer* (in women) contains more information on advances in treatment because almost all breast cancer clinical trials and research are done in women.

### **Causes of breast cancer and breast cancer prevention**

Studies continue to uncover lifestyle factors and habits that alter breast cancer risk. Ongoing studies are looking at the effect of exercise, weight gain or loss, and diet on breast cancer risk.

Studies on the best use of genetic testing for BRCA1 and BRCA2 mutations continue at a rapid pace. Some studies have found that men with mutations in these genes may be more likely to develop some other cancers, including prostate cancer, stomach cancer, pancreas cancer, and melanoma. The risks for these cancers will be further defined in future studies.

Other genes that contribute to breast cancer risk are also being identified. Scientists are also exploring how common gene variations may affect breast cancer risk. Each gene variant has only a modest effect in risk (10% to 20%), but when taken together they may possibly have a large impact.

A large ongoing study of causes of male breast cancer has recently identified several genetic variations associated with breast cancer risk. It reveals that the effect of these genetic variations on risk is different for men and women. This suggests differences in the biology of breast cancer in men and women. Work is ongoing to further evaluate these differences.

Potential causes of breast cancer in the environment have also received more attention in recent years. While much of the science on this topic is still in its earliest stages, this is an area of active research.

### **New laboratory tests**

#### **Gene expression studies**

One of the problems with early stage breast cancer is that doctors cannot always accurately predict who has a higher risk of the cancer coming back after treatment. That is why almost everyone, except for those with small tumors, receives some sort of

adjuvant treatment after surgery. To try to better pick out who will need adjuvant therapy, researchers have looked at many aspects of breast cancers.

In recent years, scientists have been able to link certain patterns of genes with more aggressive breast cancers in women -- those that tend to come back and spread to distant sites. Some lab tests based on these findings, such as the Oncotype DX and MammaPrint tests, are already available, although doctors are still trying to determine the best way to use them. It is not yet clear how useful these tests might be in men. For more information, see the separate American Cancer Society document, *Breast Cancer*.

## **Circulating tumor cells**

Researchers have found that in many breast cancers, cells may break away from the tumor and enter the blood. These circulating tumor cells can be detected with sensitive lab tests. These tests are not yet available for general use, but they may eventually help find out if a treatment (such as chemotherapy) is working or to detect cancer recurrence after treatment.

## **Treatment**

### **Radiation therapy**

For men who need radiation after breast-conserving surgery, newer techniques may be as effective while offering a more convenient way to receive it (as opposed to the standard daily radiation treatments that take several weeks to complete).

**Hypofractionated radiation:** Doctors are comparing giving larger daily doses of radiation over fewer days to the standard radiation schedule. Studies in women have shown that, giving radiation over 3 weeks seems to be about as effective as the standard 5-week course. Other studies have looked at giving even larger daily doses over an even shorter time, such as a week. But again, these studies have included few, if any, men, so it isn't clear how helpful these schedules will be in treating men with breast cancer.

### **Chemotherapy**

Because advanced breast cancers are often hard to treat, researchers are looking for newer drugs.

A drug has been developed that targets cancers caused by BRCA mutations. It is in a class of drugs called PARP inhibitors and is called olaparib. It was successful in treating breast, ovarian, and prostate cancers that had spread and were resistant to other treatments. Further studies are under way to see if this drug can help patients without BRCA mutations.

## Targeted therapies

Targeted therapies are a group of newer drugs that specifically take advantage of gene changes in cells that cause cancer.

**Drugs that target HER2:** Two drugs that target excess HER2 protein, trastuzumab (Herceptin) and lapatinib (Tykerb) are approved for use. Studies continue to see which of these is best for treating early breast cancer. Other drugs that target the HER2 protein are being tested in clinical trials, including TDM-1, pertuzumab and neratinib. Researchers are also looking at using a vaccine to target the HER2 protein.

**Anti-angiogenesis drugs:** In order for cancers to grow, blood vessels must develop to nourish the cancer cells. This process is called *angiogenesis*. Looking at angiogenesis in breast cancer specimens can help predict prognosis. Some studies have found that breast cancers surrounded by many new, small blood vessels are likely to be more aggressive. More research is needed to confirm this.

Bevacizumab (Avastin) is an anti-angiogenesis drug that once showed promise in the treatment of metastatic breast cancer. Although bevacizumab turned out to not be very helpful in the treatment of breast cancer, this approach still may prove useful in breast cancer treatment. Several other anti-angiogenesis drugs are being tested in clinical trials.

**Drugs that target EGFR:** The epidermal growth factor receptor (EGFR) is another protein found in high amounts on the surfaces of some cancer cells. Some drugs that target EGFR, such as cetuximab (Erbix<sup>®</sup>) and erlotinib (Tarceva<sup>®</sup>), are already used to treat other types of cancers, while other anti-EGFR drugs are still considered experimental. Studies are now being done to see if these drugs might be effective against some types of breast cancer.

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

## Bisphosphonates

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

Some studies have suggested that zoledronic acid may help other systemic therapies (such as hormone treatment and chemo) work better. In one study, the patients getting zoledronic acid with chemo had their tumors shrink more than those treated with chemo alone. In other studies, giving zoledronic acid with other adjuvant treatment reduced the risk of the cancer coming back. Some more recent studies have not shown a benefit of giving this drug with adjuvant chemo. More studies are needed to determine if bisphosphonates should become part of standard therapy for early-stage breast cancer.

## **Denosumab**

Denosumab (Xgeva, Prolia) is another drug that can be used to help strengthen and reduce the risk of fractures in bones that have been weakened by metastatic breast cancer. Studies to see if it can help adjuvant treatments work better are going on now.

## **Additional resources about breast cancer in men**

### **More information from Your American Cancer Society**

The following related information may also be helpful to you. These materials may be ordered from our toll-free number, 1-800-227-2345.

After Diagnosis: A Guide for Patients and Families (also available in Spanish)

Bone Metastasis (also available in Spanish)

Breast Cancer (also available in Spanish)

Breast Cancer Dictionary (booklet)

Chemo Brain

Living With Uncertainty: The Fear of Cancer Recurrence

Lymphedema: What Every Woman With Breast Cancer Should Know (also available in Spanish)

Mammograms and Other Breast Imaging Procedures

Sexuality for the Man With Cancer (also available in Spanish)

When Cancer Doesn't Go Away

When Your Cancer Comes Back: Cancer Recurrence

The following books are available from the American Cancer Society. Call us at 1-800-227-2345 to ask about costs or to place your order.

*American Cancer Society's Guide to Pain Control: Understanding and Managing Cancer Pain, Revised Edition*

*Cancer in the Family: Helping Children Cope With a Parent's Illness*

*Caregiving: A Step-By-Step Resource for Caring for the Person With Cancer at Home, Revised Edition*

*What Helped Me Get Through: Cancer Patients Share Wisdom and Hope*

## *What to Eat During Cancer Treatment*

### **National organizations and web sites\***

In addition to the American Cancer Society, other sources of patient information and support include:

#### **National Cancer Institute**

Toll-free number: 1-800-422-6237 (1-800-4-CANCER)

Web site: [www.cancer.gov](http://www.cancer.gov)

#### **Susan G. Komen for the Cure**

Toll-free number: 1-877-465-6636

Web site: [www.komen.org](http://www.komen.org)

#### **Y-Me National Breast Cancer Organization**

Toll-free number: 1-800-221-2141 (English), 1-800-986-9505 (Spanish)

Web site: [www.y-me.org](http://www.y-me.org)

*\*Inclusion on this list does not imply endorsement by the American Cancer Society.*

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at 1-800-227-2345 or visit [www.cancer.org](http://www.cancer.org).

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