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Breast Cancer



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Introduction

Breast cancer is one of the most common forms of cancer. Breast cancer is also one of the leading causes of death in the U.S. Therefore, health care professionals should possess insight into breast cancer in order to optimize patient care. This course reviews the fundamental aspects of breast cancer care, while highlighting breast cancer screening recommendations, breast cancer staging, and treatment.

Section 1: Breast Cancer

This section of the course will review some of the fundamental aspects of breast cancer care. The information found within this section of the course was derived from materials provided by the Centers for Disease Control and Prevention (CDC) unless, otherwise, specified (Centers for Disease Control and Prevention [CDC], 2022).

What is breast cancer?

Breast cancer may refer to a type of cancer that is characterized by abnormal cell growth in the breast(s).

Health care professionals should note that breast cancer can affect women and men.

Where does breast cancer begin?

Breast cancer can begin in different parts of the breast.

A breast is made up of three main parts: lobules, ducts, and connective tissue. The lobules may refer to the glands that produce milk. The ducts may refer to the tubes that carry milk to the nipple. The connective tissue holds everything together. Health care professionals should note that most breast cancers begin in the ducts or lobules.

What are the risk factors for breast cancer?

- **Female** - being born female is the main risk factor for breast cancer.

- **Age** - the risk for breast cancer increases with age; most breast cancers are diagnosed after age 50.
- **Genes** - approximately 5% to 10% of breast cancer cases are believed to be hereditary, meaning that they result directly from gene mutations passed on from a parent; the most common cause of hereditary breast cancer is an inherited mutation in the BRCA1 or BRCA2 gene; in normal cells, the aforementioned genes help make proteins that repair damaged DNA; mutated versions of these genes can lead to abnormal cell growth, which can lead to cancer (note: hereditary breast cancer may refer to cancer that runs in a family, and could be caused by a change in certain genes that were inherited from a parent (American Cancer Society, 2021). Health care professionals should note the following: if individuals inherited a mutated copy of the BRCA1 or BRCA2 gene from a parent, they have a higher risk of breast cancer; on average, a woman with a BRCA1 or BRCA2 gene mutation has up to a 7 in 10 chance of getting breast cancer by age 80; women with one of these mutations are more likely to be diagnosed with breast cancer at a younger age, as well as to have cancer in both breasts; women with one of these gene changes also have a higher risk of developing ovarian cancer and some other cancers; men who inherit one of these gene changes also have a higher risk of breast and some other cancers (American Cancer Society, 2021).
- **Family history** - as previously alluded to, a family history of breast or ovarian cancer is a risk factor for breast cancer; a woman's risk for breast cancer is higher if she has a mother, sister, or daughter (first-degree relative) or multiple family members on either her mother's or father's side of the family who had breast or ovarian cancer; having a first-degree male relative with breast cancer also raises a woman's risk of developing breast cancer.
- **Personal history** of breast cancer or certain non-cancerous breast diseases - women who had breast cancer are more likely to get breast cancer a second time. Some non-cancerous breast diseases such as atypical hyperplasia or lobular carcinoma in situ are associated with a higher risk of getting breast cancer. Health care professionals should note the following: a woman with cancer in one breast has a higher risk of developing a new cancer in the other breast or in another part of the same breast; this is different from a recurrence or return of the first cancer (American Cancer Society, 2021).

- **Dense breasts** - dense breasts may refer to breasts that have more connective tissue than fatty tissue; women with dense breasts are more likely to get breast cancer. Health care professionals should note the following: breast density reflects the amount of fibrous and glandular tissue in a woman's breasts compared with the amount of fatty tissue in the breasts, as seen on a mammogram; a mammogram may refer to an X-ray picture of a breast.
- **Height** - evidence indicates that taller women have a higher risk of breast cancer than shorter women; the reason may be related to factors that affect early growth, such as nutrition early in life, as well as hormonal or genetic factors (American Cancer Society, 2021).
- **Reproductive history** - starting menstrual periods before the age of 12 and starting menopause after the age of 55 expose women to hormones longer, raising their risk of getting breast cancer.
- **Previous treatment using radiation therapy** - women who had radiation therapy to the chest or breasts (e.g., for the treatment of Hodgkin's lymphoma) before age 30 have a higher risk of getting breast cancer later in life.
- **Exposure to the drug diethylstilbestrol (DES)** - diethylstilbestrol (DES) may refer to a synthetic form of the female hormone estrogen. DES was given to some pregnant women in the U.S. between 1940 and 1971 to prevent a miscarriage; women who took DES, or whose mothers took DES while pregnant with them, have a higher risk of getting breast cancer.
- **Physical activity** - women who are not physically active have a higher risk of getting breast cancer. Health care professionals should note the following: research suggests that regular physical activity reduces breast cancer risk, especially in women past menopause.
- **Overweight and obese** - being overweight and obese after menopause increases breast cancer risk. Health care professionals should note the following: before menopause, a woman's ovaries make most of her estrogen, and fat tissue makes only a small part of the total amount; after menopause (when the ovaries stop making estrogen), most estrogen comes from fat tissue; having more fat tissue after menopause can raise estrogen levels and increase the chances of getting breast cancer; women who are overweight also tend to have higher blood insulin

levels; higher insulin levels have been linked to some cancers, including breast cancer (American Cancer Society, 2022).

- **Not having children** - women who did not have children have a slightly higher breast cancer risk overall (American Cancer Society, 2022).
- **Not breastfeeding** - research suggests that breastfeeding may slightly lower breast cancer risk, especially if it continues for a year or more (American Cancer Society, 2022).
- **Birth control** - some birth control methods use hormones, which might increase breast cancer risk (American Cancer Society, 2022). Health care professionals should note the following: studies indicate that women using oral contraceptives (birth control pills) have a slightly higher risk of breast cancer than women who never used them (note: once the oral contraceptives are stopped, this risk seems to go back to normal within about 10 years); studies suggest that getting long-acting progesterone shots (e.g., Depo-Provera) every three months for birth control might increase breast cancer risk; birth control implants, intrauterine devices (IUDs), skin patches, and vaginal rings also use hormones, which may lead to breast cancer growth; studies suggest a link between the use of hormone-releasing IUDs and breast cancer risk (American Cancer Society, 2022).
- **Menopausal hormone therapy (MHT)** - menopausal hormone therapy (MHT) with estrogen (often combined with progesterone) has been used to help relieve the symptoms of menopause and help prevent osteoporosis (thinning of the bones); some forms of hormone replacement therapy (those that include both estrogen and progesterone) taken during menopause can raise the risk for breast cancer when taken for more than five years.
- **Alcohol** - drinking alcohol raises women's risk of getting breast cancer. Health care professionals should note the following: all alcoholic drinks, including red and white wine, beer, and liquor, are linked with cancer. Health care professionals should also note the following possible reason why alcohol is linked with cancer: when individuals drink alcohol, their bodies break it down into a chemical called acetaldehyde; acetaldehyde damages the DNA and prevents the body from repairing damage; DNA is the cell's "instruction manual" that controls a cell's normal growth and function; when DNA is damaged, a cell can begin growing out of control and create a cancer tumor.

What are the symptoms of breast cancer?

The symptoms of breast cancer include the following:

- A new lump in the breast or underarm (i.e., armpit)
- Thickening or swelling of part of the breast
- Irritation of breast skin
- Dimpling of breast skin (e.g., the breast skin may look like an orange peel)
- Redness in the nipple area or the breast
- Flaky skin in the nipple area or the breast
- Breast pain
- Nipple pain
- Nipple retraction (i.e., nipple turning inward)
- Nipple discharge other than breast milk, including blood
- Any change in the size or the shape of the breast
- Swollen lymph nodes under the arm or near the collarbone

Health care professionals should note the following: some individuals may not develop breast cancer symptoms; a new lump in the breast or underarm is the most common symptom of breast cancer; a painless, hard mass that has irregular edges is more likely to be cancer - however, breast cancers can also be soft, round, tender, or even painful.

What are the screening recommendations for breast cancer?

Screening may refer to tests and/or exams used to find a disease in individuals that do not have any apparent symptoms.

The American Cancer Society provides the recommendations found below (American Cancer Society, 2022).

- Women between 40 and 44 have the option to start screening with a mammogram every year.
- Women 45 to 54 should get mammograms every year.
- Women 55 and older can switch to a mammogram every other year, or they can choose to continue yearly mammograms. Screening should continue as long as a woman is in good health and is expected to live at least 10 more years.
- All women should understand what to expect when getting a mammogram for breast cancer screening, and what the test can and cannot do.
- Clinical breast exams are not recommended for breast cancer screening among average-risk women at any age.
- Women who are at high risk for breast cancer based on certain factors should get a breast magnetic resonance imaging (MRI) and a mammogram every year, typically starting at age 30. This includes women who: have a lifetime risk of breast cancer of about 20% to 25% or greater, according to risk assessment tools that are based mainly on family history; have a known BRCA1 or BRCA2 gene mutation (based on genetic testing); have a first-degree relative (e.g., parent, brother, sister, or child) with a BRCA1 or BRCA2 gene mutation, and have not had genetic testing themselves; had radiation therapy to the chest when they were between the ages of 10 and 30 years; have Li-Fraumeni syndrome, Cowden syndrome, or Bannayan-Riley-Ruvalcaba syndrome, or have first-degree relatives with one of the aforementioned syndromes.

The United States Preventive Services Task Force (USPSTF) provides the recommendations found below.

- Women who are 50 to 74 years old and are at average risk for breast cancer should get a mammogram every two years.
- Women who place a higher value on the potential benefit than the potential harms may choose to begin biennial screening between the ages of 40 and 49 years.
- For women who are at average risk for breast cancer, most of the benefit of mammography results from biennial screening during ages 50 to 74 years. Of all of the age groups, women aged 60 to 69 years are most likely to avoid breast

cancer death through mammography screening. While screening mammography in women aged 40 to 49 years may reduce the risk for breast cancer death, the number of deaths averted is smaller than that in older women and the number of false-positive results and unnecessary biopsies is larger. The balance of benefits and harms is likely to improve as women move from their early to late 40s.

- All women undergoing regular screening mammography are at risk for the diagnosis and treatment of noninvasive and invasive breast cancer that would otherwise not have become a threat to their health, or even apparent, during their lifetime (known as "overdiagnosis"). Beginning mammography screening at a younger age and screening more frequently may increase the risk for overdiagnosis and subsequent overtreatment.
- Women with a parent, sibling, or child with breast cancer are at higher risk for breast cancer and thus may benefit more than average-risk women from beginning screening in their 40s.

How is breast cancer diagnosed?

Breast cancer is diagnosed by a health care professional, and is typically based on the results of the following tests and imaging procedures: breast ultrasound, mammogram, breast magnetic resonance imaging (MRI), and biopsy.

- **Breast ultrasound** - a breast ultrasound may refer to a machine that uses sound waves to create pictures, called sonograms, of areas inside the breast.
- **Mammogram** - as previously mentioned, a mammogram may refer to an X-ray picture of a breast. If an individual has a problem with a breast or a symptom of breast cancer (e.g., a lump), or if an area of the breast looks abnormal on a screening mammogram, health care professionals may recommend a diagnostic mammogram.
- **Breast magnetic resonance imaging (MRI)** - breast magnetic resonance imaging (MRI) may refer to a kind of body scan that uses a magnet linked to a computer. Health care professionals should note that a breast MRI scan will make detailed pictures of areas inside the breast.
- **Biopsy** - a biopsy may refer to a test that is characterized by the removal of tissue or fluid from a part of the body (e.g., breast) to be looked at under a microscope

for evaluation and further testing. Health care professionals should note that there are different kinds of biopsies (e.g., fine-needle aspiration, core biopsy, or open biopsy).

Section 1 Summary

Breast cancer may refer to a type of cancer that is characterized by abnormal cell growth in the breast(s). Risk factors for breast cancer include the following: being born female, age, genes, family history of breast cancer or ovarian cancer, personal history of breast cancer or certain non-cancerous breast diseases, dense breasts, height (e.g., being tall), reproductive history, previous treatment using radiation therapy, exposure to the drug DES, a lack of physical activity, being overweight or obese, not having children, not breastfeeding, birth control use, MHT, and drinking alcohol. Some individuals may not develop breast cancer symptoms, therefore, breast cancer screening is essential to patient care. Health care professionals should ensure that women, over the age of 40, have the option to start breast cancer screening.

Section 1 Key Concepts

- Breast cancer can affect women and men.
- Breast cancer can begin in different parts of the breast.
- Being born female is the main risk factor for breast cancer.
- Some individuals may not develop breast cancer symptoms.
- A new lump in the breast or underarm is the most common symptom of breast cancer.
- Individuals should be screened for breast cancer, when applicable.

Section 1 Key Terms

Breast cancer - a type of cancer that is characterized by abnormal cell growth in the breast(s)

Lobules (breast lobules) - the glands that produce milk

Ducts (breast ducts) - the tubes that carry milk to the nipple

Hereditary breast cancer - cancer that runs in a family, and could be caused by a change in certain genes that were inherited from a parent

Dense breasts - breasts that have more connective tissue than fatty tissue

Mammogram - an X-ray picture of a breast

Diethylstilbestrol (DES) - a synthetic form of the female hormone estrogen

Screening - tests and/or exams used to find a disease in individuals that do not have any apparent symptoms

Breast ultrasound - a machine that uses sound waves to create pictures, called sonograms, of areas inside the breast

Breast magnetic resonance imaging (MRI) - a kind of body scan that uses a magnet linked to a computer

Biopsy - a test that is characterized by the removal of tissue or fluid from a part of the body (e.g., breast) to be looked at under a microscope for evaluation and further testing

Section 1 Personal Reflection Question

How can health care professionals integrate breast cancer screening into patient care?

Section 2: Breast Cancer Staging

This section of the course will focus on breast cancer staging. The information found within this section of the course was derived from materials provided by the National Cancer Institute unless, otherwise, specified (National Cancer Institute, 2022).

- Breast cancer is progressive - meaning it grows, spreads, and/or becomes more destructive to the body over time. Due to the progressive nature of breast cancer, it is classified into stages. The term stages or stage, when applied to cancer, is used to describe the state of cancer progression upon examination. In other words, the term stage is used to describe how much cancer is in the body, and the location of the cancer in the body when examined.

- Breast cancer staging is based on the size and location of the primary tumor, the spread of cancer to nearby lymph nodes or other parts of the body, tumor grade, and whether certain biomarkers are present.
- When staging breast cancer, health care professionals typically use the TNM system, the grading system, and biomarker status.
- The **TNM** system is used to describe the size of the primary tumor and the spread of cancer to nearby lymph nodes or other parts of the body. The **TNM** system is based on the following three key elements: the extent (size) of the **Tumor**; the spread to nearby lymph **N**odes (e.g., has the cancer spread to nearby lymph nodes); the **M**etastasis (i.e., spread) to distant sites (note: tumor sizes are often measured in millimeters [mm] or centimeters; common items that can be used to show tumor size in mm include: a sharp pencil point [1 mm], a new crayon point [2 mm], a pencil-top eraser [5 mm], a pea [10 mm], a peanut [20 mm], and a lime [50 mm]).
- The **TNM** system stages the extent (size) of the **Tumor**. Tumor stages may be found below.
 - TX - primary tumor cannot be assessed.
 - T0 - no sign of a primary tumor in the breast.
 - Tis - carcinoma in situ; carcinoma in situ may refer to a condition in which abnormal cells that look like cancer cells under a microscope are found only in the place where they first formed and have not spread to nearby tissue.
 - Tis (DCIS) - ductal carcinoma in situ (DCIS) may refer to a condition in which abnormal cells are found in the lining of a breast duct; the abnormal cells have not spread outside of the duct to other tissues in the breast (note: DCIS may become invasive breast cancer that is able to spread to other tissues).
 - Tis (Paget disease) - Paget disease of the nipple may refer to a condition in which abnormal cells are found in the skin cells of the nipple and may spread to the areola (note: Paget disease is not staged according to the

TNM system; if Paget disease and an invasive breast cancer are present, the TNM system is used to stage the invasive breast cancer).

- T1 - the tumor is 20 millimeters or smaller.
 - T1mi - the tumor is 1 millimeter or smaller.
 - T1a - the tumor is larger than 1 millimeter but not larger than 5 millimeters.
 - T1b - the tumor is larger than 5 millimeters but not larger than 10 millimeters.
 - T1c - the tumor is larger than 10 millimeters but not larger than 20 millimeters.
 - T2 - the tumor is larger than 20 millimeters but not larger than 50 millimeters.
 - T3 - the tumor is larger than 50 millimeters.
 - T4a - the tumor has grown into the chest wall.
 - T4b - the tumor has grown into the skin - an ulcer has formed on the surface of the skin on the breast, small tumor nodules have formed in the same breast as the primary tumor, and/or there is swelling of the skin on the breast.
 - T4c - the tumor has grown into the chest wall and the skin.
 - T4d - inflammatory breast cancer - one-third or more of the skin on the breast is red, swollen, and/or dimpled, which may be referred to as peau d'orange (note: inflammatory breast cancer may refer to a type of breast cancer in which the breast looks red and swollen and feels warm).
- When the lymph **N**odes are removed by surgery and studied under a microscope by a pathologist, pathologic staging is used to describe the lymph **N**odes. The pathologic staging of lymph **N**odes may be found below.
 - NX - the lymph nodes cannot be assessed.

- N0 - no sign of cancer in the lymph nodes, or tiny clusters of cancer cells not larger than 0.2 millimeters in the lymph nodes.
- N1mi - cancer has spread to the axillary (armpit area) lymph nodes and is larger than 0.2 millimeters but not larger than 2 millimeters.
- N1a - cancer has spread to 1 to 3 axillary lymph nodes and the cancer in at least one of the lymph nodes is larger than 2 millimeters.
- N1b - cancer has spread to lymph nodes near the breastbone on the same side of the body as the primary tumor, and the cancer is larger than 0.2 millimeters and is found by sentinel lymph node biopsy. Cancer is not found in the axillary lymph nodes.
- N1c - cancer has spread to 1 to 3 axillary lymph nodes and the cancer in at least one of the lymph nodes is larger than 2 millimeters; cancer is also found by sentinel lymph node biopsy in the lymph nodes near the breastbone on the same side of the body as the primary tumor.
- N2a - cancer has spread to 4 to 9 axillary lymph nodes and the cancer in at least one of the lymph nodes is larger than 2 millimeters.
- N2b - cancer has spread to lymph nodes near the breastbone and the cancer is found by imaging tests. Cancer is not found in the axillary lymph nodes by sentinel lymph node biopsy or lymph node dissection.
- N3a - cancer has spread to 10 or more axillary lymph nodes and the cancer in at least one of the lymph nodes is larger than 2 millimeters, or cancer has spread to lymph nodes below the collarbone.
- N3b - cancer has spread to 1 to 9 axillary lymph nodes and the cancer in at least one of the lymph nodes is larger than 2 millimeters; cancer has also spread to lymph nodes near the breastbone and the cancer is found by imaging tests; or cancer has spread to 4 to 9 axillary lymph nodes and cancer in at least one of the lymph nodes is larger than 2 millimeters; cancer has also spread to lymph nodes near the breastbone on the same side of the body as the primary tumor, and the cancer is larger than 0.2 millimeters and is found by sentinel lymph node biopsy.

- N3c - cancer has spread to lymph nodes above the collarbone on the same side of the body as the primary tumor.
- **Metastasis stages may be found below.**
 - M0 - there is no sign that cancer has spread to other parts of the body.
 - M1 - cancer has spread to other parts of the body, most often the bones, lungs, liver, or brain; if cancer has spread to distant lymph nodes, the cancer in the lymph nodes is larger than 0.2 millimeters.
- When staging breast cancer a grading system is used to describe how quickly a breast tumor is likely to grow and spread.
- The grading system describes a tumor based on how abnormal the cancer cells and tissue look under a microscope and how quickly the cancer cells are likely to grow and spread. Health care professionals should note that low-grade cancer cells look more like normal cells and tend to grow and spread more slowly than high-grade cancer cells.
- For each feature, a pathologist assigns a score of 1 to 3; a score of 1 means the cells and tumor tissue look the most like normal cells and tissue, and a score of 3 means the cells and tissue look the most abnormal; the scores for each feature are added together to get a total score between 3 and 9. The three grades found below are possible.
 - Total score of 3 to 5 - G1 (Low grade or well differentiated).
 - Total score of 6 to 7 - G2 (Intermediate grade or moderately differentiated).
 - Total score of 8 to 9 - G3 (High grade or poorly differentiated).
- When staging breast cancer biomarker testing is used to find out whether breast cancer cells have certain receptors.
- For breast cancer, biomarker testing includes the following:
 - Estrogen receptor (ER) - if the breast cancer cells have estrogen receptors, the cancer cells are called ER positive (ER+); if the breast cancer cells do not have estrogen receptors, the cancer cells are called ER negative (ER-).

- Progesterone receptor (PR) - if the breast cancer cells have progesterone receptors, the cancer cells are called PR positive (PR+); if the breast cancer cells do not have progesterone receptors, the cancer cells are called PR negative (PR-).
- Human epidermal growth factor type 2 receptor (HER2/neu or HER2) - if the breast cancer cells have larger than normal amounts of HER2 receptors on their surface, the cancer cells are called HER2 positive (HER2+); if the breast cancer cells have a normal amount of HER2 on their surface, the cancer cells are called HER2 negative (HER2-) (note: HER2+ breast cancer is more likely to grow and divide faster than HER2- breast cancer).
- Additionally, the breast cancer cells may be described as triple negative or triple positive.
 - Triple negative - if the breast cancer cells do not have estrogen receptors, progesterone receptors, or a larger than normal amount of HER2 receptors, the cancer cells are called triple negative.
 - Triple positive - if the breast cancer cells do have estrogen receptors, progesterone receptors, and a larger than normal amount of HER2 receptors, the cancer cells are called triple positive.
- Health care professionals should note that the TNM system, the grading system, and biomarker status are combined to determine the breast cancer stage. For example, if the tumor size is 30 millimeters (T2), has not spread to nearby lymph nodes (N0), has not spread to distant parts of the body (M0), and is: Grade 1, HER2+, ER-, and PR-; the cancer is stage IIA.
- Health care professionals should note that breast cancer is typically classified or described in stages 0 - IV.

Section 2 Summary

Breast cancer is progressive - meaning it grows, spreads, and/or becomes more destructive to the body over time. Due to the progressive nature of breast cancer, it is classified into stages. Breast cancer staging is based on the size and location of the primary tumor, the spread of cancer to nearby lymph nodes or other parts of the body, tumor grade, and whether certain biomarkers are present. When staging breast cancer,

health care professionals should use the TNM system, the grading system, and biomarker status. Health care professionals should note that breast cancer is typically classified or described in stages 0 - IV.

Section 2 Key Concepts

- Breast cancer is progressive.
- The TNM system, the grading system, and biomarker status are combined to determine the breast cancer stage.
- Breast cancer is typically classified or described in stages 0 - IV.

Section 2 Key Terms

Stage (when applied to cancer) - the state of cancer progression upon examination

Carcinoma in situ - a condition in which abnormal cells that look like cancer cells under a microscope are found only in the place where they first formed and have not spread to nearby tissue

Ductal carcinoma in situ (DCIS) - a condition in which abnormal cells are found in the lining of a breast duct; the abnormal cells have not spread outside of the duct to other tissues in the breast

Paget disease of the nipple - a condition in which abnormal cells are found in the skin cells of the nipple and may spread to the areola

Inflammatory breast cancer - a type of breast cancer in which the breast looks red and swollen and feels warm

Peau d' orange - one-third or more of the skin on the breast is red, swollen, and/or dimpled

Section 2 Personal Reflection Question

Why is it important to stage breast cancer?

Section 3: Treatment

This section of the course will highlight specific treatment options for breast cancer. The information found within this section of the course was derived from materials provided by the National Cancer Institute unless, otherwise, specified (National Cancer Institute, 2022).

Surgery

- Most patients with breast cancer have surgery to remove the cancer.
- The following types of surgery may be used to remove breast cancer: sentinel lymph node biopsy, breast-conserving surgery, total mastectomy, and modified radical mastectomy.
- Sentinel lymph node biopsy is the removal of the sentinel lymph node during surgery. The sentinel lymph node is the first lymph node in a group of lymph nodes to receive lymphatic drainage from the primary tumor; it is the first lymph node the cancer is likely to spread to from the primary tumor.
- Breast-conserving surgery may refer to an operation to remove the cancer and some normal tissue around it, but not the breast itself. Part of the chest wall lining may also be removed if the cancer is near it.
- A total mastectomy may refer to a surgery to remove the whole breast that has cancer. This procedure is also called a simple mastectomy. Some of the lymph nodes under the arm may be removed and checked for cancer. This may be done at the same time as the breast surgery or after.
- Modified radical mastectomy may refer to surgery to remove the whole breast that has cancer, and most of the lymph nodes under the arm. This may include removal of the nipple, areola, (the dark-colored skin around the nipple), and skin over the breast.
- Health care professionals should note the following: chemotherapy may be given before surgery to remove the tumor; when given before surgery, chemotherapy will shrink the tumor and reduce the amount of tissue that needs to be removed during surgery (note: chemotherapy may refer to a type of treatment that uses

drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing).

- Health care professionals should note the following: after a health care professional removes all of the cancer that can be seen at the time of the surgery, some patients may be given radiation therapy, chemotherapy, targeted therapy, or hormone therapy after surgery, to kill any cancer cells that are left (note: radiation therapy may refer to a type of treatment that uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing; targeted therapy may refer to a type of treatment that uses drugs or other substances to identify and attack specific types of cancer cells with less harm to normal cells; hormone therapy may refer to a type of treatment that adds, blocks, or removes hormones).

Radiation Therapy

- External radiation therapy and/or internal radiation therapy may be used in breast cancer treatment.
- External radiation therapy involves the use of a machine outside of the patient's body to send radiation toward the area of the body with cancer.
- Internal radiation therapy involves the use of a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the patient's cancer.
- Health care professionals should note the following: the way the radiation therapy is given to patients depends on the type and stage of the cancer being treated; external radiation therapy is used to treat breast cancer; internal radiation therapy with strontium-89 is used to relieve bone pain caused by breast cancer that has spread to the bones.

Chemotherapy

- Chemotherapy may be given by mouth, injection, or infusion, or on the skin, depending on the type and stage of the cancer being treated; it may be given alone or with other treatments, such as: surgery, radiation therapy, or biologic therapy.

- The following chemotherapy drugs may be used in breast cancer treatment: anthracyclines, such as doxorubicin (Adriamycin) and epirubicin (Ellence); taxanes, such as paclitaxel (Taxol) and docetaxel (Taxotere); and 5-fluorouracil (5-FU).
- Health care professionals should note the following common side effects of chemotherapy: hair loss, fatigue, loss of appetite, nausea, vomiting, constipation, diarrhea, mouth sores, skin changes, nail changes, and increased risk of developing infection.

Hormone Therapy

- Hormone therapy with tamoxifen is often given to patients with early localized breast cancer that can be removed by surgery and those with metastatic breast cancer (cancer that has spread to other parts of the body). Health care professionals should note the following: hormone therapy with tamoxifen or estrogens can act on cells all over the body and may increase the chance of developing endometrial cancer; women taking tamoxifen should have a pelvic exam every year to look for any signs of cancer, as well as vaginal bleeding.
- Hormone therapy with a luteinizing hormone-releasing hormone (LHRH) agonist is given to some premenopausal women who were diagnosed with hormone receptor positive breast cancer. Health care professionals should note that LHRH agonists decrease the body's estrogen and progesterone.
- Hormone therapy with an aromatase inhibitor is given to some postmenopausal women who have hormone receptor positive breast cancer. Health care professionals should note that aromatase inhibitors decrease the body's estrogen by blocking an enzyme called aromatase from turning androgen into estrogen; examples of aromatase inhibitors include: anastrozole, letrozole, and exemestane.
- For the treatment of early localized breast cancer that can be removed by surgery, certain aromatase inhibitors may be used as adjuvant therapy instead of tamoxifen or after two to three years of tamoxifen use.
- In women with hormone receptor positive breast cancer, at least five years of adjuvant hormone therapy reduces the risk that the cancer will recur.

Targeted Therapy

- As previously mentioned, targeted therapy may refer to a type of treatment that uses drugs or other substances to identify and attack specific cancer cells.
- Targeted therapies usually cause less harm to normal cells than chemotherapy or radiation therapy.
- Examples of targeted therapies include monoclonal antibodies and tyrosine kinase inhibitors.
- Monoclonal antibodies may refer to a type of protein, developed in a laboratory, that can bind to certain targets in the body, such as antigens on the surface of cancer cells. Monoclonal antibodies attach to a specific target on cancer cells or other cells that may help cancer cells grow; once attached to a cell, monoclonal antibodies are able to then kill the cancer cells, block their growth, or keep them from spreading. Health care professionals should note the following: monoclonal antibodies are given by infusion; they may be used alone or to carry drugs, toxins, or radioactive material directly to cancer cells; monoclonal antibodies may be used in combination with chemotherapy as adjuvant therapy; trastuzumab is a type of monoclonal antibody.
- A tyrosine kinase inhibitor may refer to a substance that blocks the action of enzymes called tyrosine kinases (note: tyrosine kinases are a part of many cell functions, including cell signaling, growth, and division). Tyrosine kinase inhibitors block signals needed for tumors to grow. Health care professionals should note that tyrosine kinase inhibitors may be used with other anticancer drugs as adjuvant therapy; tucatinib is an example of a tyrosine kinase inhibitor.

Immunotherapy

- Immunotherapy may refer to a type of treatment that uses the patient's immune system to fight cancer.
- Immunotherapy uses substances made by the body or made in a laboratory to boost, direct, or restore the body's natural defenses against cancer.
- Pembrolizumab is an example of a immunotherapy drug.

Section 3 Summary

Treatment options for breast cancer include: surgery, radiation therapy, chemotherapy, hormone therapy, targeted therapy, and immunotherapy. Health care professionals should note that a combination of the aforementioned treatment options may be used to treat a patient with breast cancer. Health care professionals should provide patients with education regarding specific breast cancer treatment options, when applicable.

Section 3 Key Concepts

- Most patients with breast cancer have surgery to remove the cancer.

Section 3 Key Terms

Sentinel lymph node biopsy - the removal of the sentinel lymph node during surgery

Breast-conserving surgery - an operation to remove the cancer and some normal tissue around it, but not the breast itself

Total mastectomy - a surgery to remove the whole breast that has cancer

Modified radical mastectomy - surgery to remove the whole breast that has cancer, and most of the lymph nodes under the arm

Chemotherapy - a type of treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing

Radiation therapy - a type of treatment that uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing

Targeted therapy - a type of treatment that uses drugs or other substances to identify and attack specific types of cancer cells with less harm to normal cells

Hormone therapy - a type of treatment that adds, blocks, or removes hormones

Monoclonal antibodies - a type of protein, developed in a laboratory, that can bind to certain targets in the body, such as antigens on the surface of cancer cells

Tyrosine kinase inhibitor - a substance that blocks the action of enzymes called tyrosine kinases

Immunotherapy - a type of treatment that uses the patient's immune system to fight cancer

Section 3 Personal Reflection Question

How can health care professionals educate patients about breast cancer treatment options, when applicable?

Conclusion

Breast cancer can impact the health, overall well-being, and quality of life of those affected. Therefore, health care professionals should be familiar with breast cancer staging and breast cancer treatment in order to optimize patient care and patient outcomes. Finally, health care professionals should ensure that all patients have the option to start breast cancer screening, when appropriate.

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