NKI dataset

272 breast cancer patients (as rows), 1570 columns.  
Network built using only gene expression.  
Meta data includes patient info, treatment, and survival.

Each node is a group of patients similar to each other. Flares (left) represent sub-populations that are distinct from the larger population. (One differentiating factor between the two flares is estrogen expression (low = top flare, high = bottom flare)). Bottom flare is a group of patients with 100% survival. Top flare shows a range of survival – very poor towards the tip (red), and very good near the base (circled).

The circled group of good survivors have genetic indicators of poor survivors (i.e. low ESR1 levels, which is typically the prognostic indicator of poor outcomes in breast cancer) – understanding this group could be critical for helping improve mortality rates for this disease. Why this group survived was quickly analysed by using the Outcome Column (here Event Death - which is binary - 0,1) as a Data Lens (which we term Supervised vs Unsupervised analyses).

Published in 2 papers - Nature and PNAS:

Paper links :  
1. <https://d1bp1ynq8xms31.cloudfront.net/wp-content/uploads/2015/02/Topology_Based_Data_Analysis_Identifies_a_Subgroup_of_Breast_Cancer_with_a_unique_mutational_profile_and_excellent_survival.pdf>

2. <https://www.nature.com/articles/srep01236>

There is more than one treatment for invasive breast cancer.

This chapter describes general treatment options and what to expect. Together, you and your care team will choose a treatment plan that is best for you.

Care team

Treating breast cancer takes a team approach.

Treatment decisions should involve a multidisciplinary team (MDT). An MDT is a team of health care and psychosocial care professionals from different professional backgrounds who have knowledge (expertise) and experience in your type of cancer.

This team is united in the planning and implementing of your treatment. Ask who will coordinate your care.

Some members of your care team will be with you throughout cancer treatment, while others will only be there for parts of it. Get to know your care team and help them get to know you.

Depending on your diagnosis, the care team might include the following:

* ﻿﻿A diagnostic radiologist interprets the results of mammograms, ultrasounds, and other imaging tests.
* ﻿﻿An interventional radiologist performs needle biopsies and places intravenous (IV) ports for treatment.
* ﻿﻿A pathologist analyzes the cells and tissues removed during a biopsy and provides cancer diagnosis, staging, and information about biomarker testing.
* ﻿﻿A surgical oncologist performs operations to remove cancer.
* ﻿﻿A reconstructive (plastic) surgeon performs breast reconstruction, if desired, for those who undergo mastectomy.
* ﻿﻿A medical oncologist treats cancer in adults using systemic therapy such as endocrine, chemotherapy, immunotherapy, or targeted therapy.
* ﻿﻿A radiation oncologist prescribes and delivers radiation therapy to treat cancer.
* ﻿﻿An anesthesiologist gives anesthesia, a medicine so you do not feel pain during surgery or procedures.
* ﻿﻿Residents and fellows are doctors who are continuing their training, some to become specialists in a certain field of medicine.
* ﻿﻿Nurse practitioners (Ns) and physician assistants (PAs) are health care providers. Some of your clinic visits may be done by a nurse practitioner or physician assistant.
* ﻿﻿Oncology nurses provide your hands-on care, like giving systemic therapy, managing your care, answering questions, and helping you cope with side effects.

﻿﻿Oncology pharmacists are experts in knowing how to use medicines to treat cancer and to manage symptoms and side effects.

* Page 2   
  Palliative care nurses, advanced practice providers (APPs), and physicians help provide an extra layer of support with cancer-related care.
* ﻿﻿Nutritionists and dietitians can provide guidance on what foods are most suitable for your condition.
* ﻿﻿An occupational therapist helps people with the tasks of daily living.
* ﻿﻿A physical therapist helps people move with greater comfort and ease.
* ﻿﻿A certified lymphedema therapist gives a type of massage called manual lymph drainage.
* ﻿﻿Psychologists and psychiatrists are mental health experts who can help manage issues such as depression, anxiety, or other mental health conditions that can affect how you think and feel.
* ﻿﻿Social workers help people solve and cope with problems in their everyday lives. Clinical social workers also diagnose and treat mental, behavioral, and emotional issues. The anxiety a person feels when diagnosed with cancer might be managed by a social worker in some cancer centers. They, or other designated professionals, can help navigate the complexities of financial and insurance stresses.
* ﻿﻿A research team helps to collect research data and coordinate care if you are in a clinical trial. Clinical trials help bring new therapies to patients and advance the treatment for everyone. Consider asking your care team about access to clinical trials.

Get to know your care team and help them get to know you.

Your physical, mental, and emotional wellbeing are important. Help other team members understand:

* ﻿﻿How vou feel
* ﻿﻿What you need
* ﻿﻿What is working and what is not

Keep a list of names and contact information for each member of your team. This will make it easier for you and anyone involved in your care to know whom to contact with questions or concerns.

Page 3

Treatment overview

Invasive breast cancer is treatable.

Treatment can be local, systemic, or usually a combination of both.

Local therapy focuses on the breast, chest wall, and lymph node area. It includes:

* ﻿﻿Mastectomy (surgery)
* ﻿﻿Radiation therapy

Systemic therapy works throughout the body. It includes:

* ﻿﻿HER2-targeted therapy
* ﻿﻿Endocrine therapy

• Chemotherapy

* ﻿﻿Immunotherapy
* ﻿﻿Myeloid growth factors

For systemic therapy examples, see Guide

2.

There are many treatment options. Many factors play a role in how the cancer will respond to treatment. It is important to have regular talks with your care team about your goals for treatment and your treatment plan.

Guide 2

Systemic therapy examples

Chemotherapy examples

* ﻿﻿Capecitabine (Xeloda)
* ﻿﻿Carboplatin
* ﻿﻿Cisplatin (Platinol)
* ﻿﻿Cyclophosphamide
* ﻿﻿Docetaxel (Taxotere)
* ﻿﻿Doxorubicin (Adriamycin, Rubex Doxorubicin)
* ﻿﻿Doxorubicin liposomal injection (Doxil)
* ﻿﻿Epirubicin (Ellence)
* ﻿﻿Eribulin (Halaven) Fluorouracil
* ﻿﻿Methotrexate
* ﻿﻿Paclitaxel (Taxol, Abraxane)
* ﻿﻿Vinorelbine (Navelbine)

HER2-targeted therapy (antibody, inhibitor, and conjugate) examples

• Pertuzumab (Perjeta)

* ﻿﻿Ado-trastuzumab emtansine • Neratinib (Nerlynx)
* ﻿﻿Trastuzumab (Herceptin)

(T-DM1) (Kadcyla)

• Tucatinib (Tukysa)

or trastuzumab substitutes

• Fam-trastuzumab

• Phesgo as a substitute

(biosimilars) such as Kanjinti,

deruxtecan-nki (Enhertu)

for combination therapy

Ogivri, Herzuma, Ontruzant, and • Lapatinib (Tykerb)

of trastuzumab with

Trazimera

• Margetuximab-cmkb

Pertuzumab

Page 4

Birth control during treatment

If you become pregnant during chemotherapy, radiation therapy, endocrine therapy, or other types of systemic therapy, serious birth defects can occur. If you had menstrual periods before starting chemotherapy, choose birth control without hormones. Condoms are an option. "The pill" or other types of hormonal birth control are usually not recommended, especially in hormone receptor-positive (HR+) cancers. Speak to your doctor about preventing pregnancy while being treated for breast cancer.

Those who want to become pregnant in the future should be referred to a fertility specialist to discuss options before starting chemotherapy and/or endocrine therapy.

Surgery

Surgery is an operation or procedure to remove cancer from the body. Surgery is the main or primary treatment for invasive breast cancer. This is only one part of a treatment plan. Systemic therapy or radiation therapy might be used before surgery to shrink the tumor or reduce the amount of cancer (called cancer burden).

* ﻿﻿Preoperative is systemic (drug) treatment before surgery. It also called neoadjuvant therapy.
* ﻿﻿Postoperative is systemic (drug) treatment after surgery. It is also called adjuvant therapy.

When preparing for surgery, seek the opinion of an experienced surgeon. The surgeon

Lymph nodes.

Breast-conserving surgery

The dotted line shows where the tumor is removed. Lumpectomy is the removal of abnormal cells or tumor. It is also called a partial mastectomy, breast-conserving therapy, or breast-conserving surgery (BCS).

Tumor

Page 5

should be an expert in performing your type of surgery. Hospitals that perform many surgeries often have better results. You can ask for a referral to a hospital or cancer center that has experience in treating your type of cancer.

The removal of the cancer through surgery can be accomplished in different ways depending on the specific circumstances, such as the size and location of the tumor, and if there is cancer in any surrounding organs and tissues.

Surgery might be a lumpectomy or mastectomy.

It is based on the safest and best way to remove the cancer and your choice. Your preferences about treatment are always important. Make your wishes known.

Surgical margins

The goal of surgery is a cancer-free surgical margin. After surgery, you may receive treatment such as radiation to kill any remaining cancer cells.

* ﻿﻿In a clear or negative margin (RO), no cancerous cells are found in the tissue around the edge of the tumor.
* ﻿﻿In an R1 resection, the surgeon removes all the visible tumor, but the microscopic margins are still positive for tumor cells. Despite best efforts this can happen.
* ﻿﻿In an R2 resection, the surgeon is unable to remove all the visible tumor or

If you are considering breast reconstruction,

there is metastatic disease.

surgery requires collaboration between a breast

surgeon and the reconstructive (plastic) surgeon. Your surgeon will look carefully for cancer

not only along the surgical margin, but in

Goal of surgery

other nearby areas. Despite best efforts, it is not always possible to find all of the cancer.

The goal of surgery or tumor resection is to

Sometimes, surgeons can't safely remove the

remove all of the cancer. To do so, the tumor

tumor with a cancer-free margin.

is removed along with a rim of normal-looking

tissue around its edge called the surgical margin. After surgery, you may receive treatment such The surgical margin may look normal during

as radiation or systemic therapy to kill any

surgery, but cancerous cells may be found when remaining cancer cells. You might have more viewed under a microscope by a pathologist. A than one surgery. You might also have a wound clear or negative margin (R) is when no cancer drain to prevent fluid from collecting in the body cells are found in the tissue around the edge of after surgery. These drains are usually removed the tumor. In a positive margin, cancer cells are a few days after surgery. found in normal-looking tissue around the tumor.

If there is a positive margin, you may require another surgery to try to remove the remaining tumor cells. Surgery usually includes removal of some lymph nodes.

Page 5

Lumpectomy

Lumpectomy is the removal of abnormal cells or tumor. It is also called breast-conserving therapy or breast-conserving surgery (BCS).

In a lumpectomy, only the tumor with an area of normal-looking tissue is removed. The rest of your breast is left alone. Extra tissue is removed around the tumor to create a cancer-free area. This cancer-free area is called a surgical margin. Having a surgical margin will decrease the chance that cancer may return in that area of the breast. You may have more than one surgery to ensure all of the cancer was removed.

A lumpectomy is usually followed by radiation therapy to part of or the whole breast and sometimes the lymph nodes. A boost is extra radiation to the tumor area.

The breast might not look the same after a lumpectomy. Speak to your surgeon about how a lumpectomy might affect the look and shape of your breast, and any concerns you have.

Certain reconstruction options, such as volume displacement, might be available.

Breastfeeding or Chestfeeding

Breastfeeding or chestfeeding following a lumpectomy may be possible. However, after treatments, the breast may produce less milk than before, or none at all. Breastfeeding/ chestfeeding is not recommended during active treatment or within 6 months of completing certain types of endocrine and targeted therapy.

Warnings about supplements and drug interactions

You might be asked to stop taking or avoid certain herbal supplements when on a systemic therapy. Some supplements can affect the ability of a drug to do its job. This is called a drug interaction.

It is critical to speak with your care team about any supplements you may be taking. Some examples include:

* ﻿﻿Turmeric
* ﻿﻿Gingko biloba
* ﻿﻿Green tea extract
* ﻿﻿St. John's Wort
* ﻿﻿Antioxidants

Certain medicines can also affect the ability of a drug to do its job. Antacids, heart or blood pressure medicine, and antidepressants are just some of the medicines that might interact with a systemic therapy. Therefore, it is very important to tell your care team about any medicines, vitamins, over-the-counter (OTC) drugs, herbals, or supplements you are taking.

Bring a list with you to every visit.

Page 6

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Mastectomy

A mastectomy is surgery to remove all or part of the breast. Sometimes, chest wall muscle under the breast is removed. Underarm sentinel lymph nodes might be removed.

Before removing the breast, the surgeon may do a sentinel lymph node biopsy (SLNB).

Sentinel lymph nodes are the first lymph nodes cancer cells are likely to have spread from the primary tumor.

Types of mastectomy include:

* ﻿﻿A total mastectomy or simple mastectomy is a surgery that removes the whole breast with an aesthetic flat skin closure.
* ﻿﻿A skin-sparing mastectomy removes the breast but not all of the skin,

in order to have breast reconstruction that might include flaps and/or implants.

• Nipple-sparing mastectomy preserves the nipple-areola complex (NAC) as well as all the skin. Not everyone is a candidate for nipple-sparing mastectomy based upon location of cancer, breast size, and breast posis (degree of drooping).

> Modified radical mastectomy removes the axillary nodes along with the breast.

Breast reconstruction is an option after a mastectomy. It might be done at the same time as mastectomy ("immediate) or at some time following the completion of cancer treatment ("delayed"). Breast reconstruction is often done in stages.

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Surgery first:

* ﻿﻿﻿Surgery and radiation therapy
* ﻿﻿﻿Adjuvant systemic therapy
* ﻿﻿﻿HR+ with HER2+

60 HR+ with HER2-

60 HR- with HER2+

60 Triple-negative breast cancer

* ﻿﻿﻿Adjuvant endocrine therapy
* ﻿﻿﻿Follow-up care

﻿﻿﻿Key points

Surgery is the main or primary treatment for invasive breast

cancer. Radiation therapy (RT) and/or systemic therapy are possible following surgery.

Together, you and your care team will choose the best option for

you.

Not all cancers need treatment before surgery.

If your oncologist is considering treatment before surgery (preoperative), then Chapter 6 is where you can find that information.

This chapter is for those who will not have preoperative therapy.

include radiation therapy and/or systemic therapy.

An example of a tumor stage after surgery might be pT2. Lymph node micrometastases are written as pN1mi. Ipsilateral means on the same side of the body.

Lumpectomy

A lumpectomy, also called breast-conserving surgery (BCS), is surgery to remove a tumor in the breast. Treatment after a lumpectomy is based on the type of cancer and if cancer is found in the axillary lymph nodes (ALNs). If there is a positive surgical margin, you might have more surgery to remove any remaining cancer. Whole breast radiation therapy (WBRT) is usually recommended after a lumpectomy. Regional node irradiation (RNI) might be added. Chemotherapy might be given before RT.

Total mastectomy

A total mastectomy is a surgery that removes the whole breast. Treatment after a mastectomy is based on if cancer was found in the axillary lymph nodes (ALNs), the number of lymph nodes that tested positive, and the size of the removed tumor. Radiation therapy and/ or systemic therapy are possible following a mastectomy.

Surgery and radiation therapy

Surgery is the main or primary treatment for invasive breast cancer. It involves removing the tumor from the breast and assessing the lymph nodes.

There are 2 breast surgery options:

* ﻿﻿Lumpectomy
* ﻿﻿Total mastectomy

Both options include axillary lymph node (ALN) staging with either sentinel lymph node biopsy

(SLNB) or axillary lymph node dissection

(ALND) or both. After surgery, a pathologist will examine the removed tissue and any lymph nodes to determine the pathologic stage.

This information will help plan next steps for treatment. Treatment after surgery might

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Adjuvant systemic therapy

Drug treatment after surgery or radiation therapy is called adjuvant systemic therapy. It is given to kill any remaining cancer cells and to help reduce the risk of cancer returning.

This treatment is based on cancer subtype called tumor histology and hormone receptor

(HR) status. Histology is the study of the anatomy (structure) of cells, tissues, and organs under a microscope. Depending on the histology, HER2 status may also be a factor. If cancer is hormone receptor-positive (ER+ and/ or PR+) and HER2-, then oncologists also take into account if there is cancer in lymph nodes called node positive (node+).

Systemic therapies might be used alone or in combination. Ask your medical oncologist why one treatment might be preferred over another for your type of cancer.

For those in menopause (natural or induced with high-risk node-negative or node-positive tumors, bone-strengthening therapy might be given to reduce the risk of distant metastasis.

Favorable histologies

A favorable histology is one that has a favorable or good prognosis. A prognosis is the course your cancer will likely take. These tumor types are not high grade, are HER2-, and might respond better to treatment than other tumors. They also might have less risk of returning. Ask your care team what this might mean for your treatment. Those with estrogen receptor-positive (ER+ and/or progesterone receptor-positive (PR+) tumors will likely have endocrine therapy as listed in Guide 6. Other systemic therapies are possible.

Favorable histology types include:

* ﻿﻿Pure tubular
* ﻿﻿Pure mucinous
* ﻿﻿Pure cribriform
* ﻿﻿Encapsulated or solid papillary carcinoma (SPC)
* ﻿﻿Adenoid cystic and other salivary carcinomas
* ﻿﻿Secretory carcinoma
* ﻿﻿Rare low-grade forms of metaplastic carcinoma
* ﻿﻿Other rare forms

Common histologies

Ductal and lobular carcinoma are the most common types of invasive breast cancer.

Common histology types include:

* ﻿﻿Ductal/no special type (NST) (NST includes medullary pattern, cancers with neuroendocrine expression, and other rare patterns)
* ﻿﻿Lobular
* ﻿﻿Mixed

• Micropapillary

> Metaplastic (includes various subtypes)

Adjuvant treatment options for common histologies are described

HR+ with HER2+

In hormone receptor-positive (HR+) cancer, estrogen (ER+) and/or progesterone receptors (PR+) are found. If HER2 receptors are

overexpressed, the cancer is also HER2+. It might be written as HR+ with HER2+ or called triple-positive breast cancer.

Guide 4

Adjuvant HER2-targeted therapy options: HER2+

Preferred options

Other recommended

Used in some cases

Notes

* ﻿﻿Paclitaxel and trastuzumab
* ﻿﻿Docetaxel, carboplatin, and trastuzumab (TCH)
* ﻿﻿Docetaxel, carboplatin, trastuzumab, and pertuzumab (TCHP)

If no residual disease after preoperative therapy or no preoperative therapy:

• Complete up to 1 year of HER2-targeted therapy with trastuzumab. Pertuzumab might be added.

If residual disease after preoperative therapy:

* ﻿﻿Ado-trastuzumab emtansine alone. If ado-trastuzumab emansine discontinued for toxicity, then trastuzumab with or without pertuzumab to complete one year of therapy.
* ﻿﻿If node positive at initial staging, trastuzumab with pertuzumab
* ﻿﻿Doxorubicin with cyclophosphamide followed by docetaxel with trastuzumab
* ﻿﻿Doxorubicin with cyclophosphamide followed by docetaxel with trastuzumab and pertuzumab
* ﻿﻿Docetaxel, cyclophosphamide, and trastuzumab
* ﻿﻿Doxorubicin and cyclophosphamide followed by paclitaxel with trastuzumab
* ﻿﻿Doxorubicin and cyclophosphamide followed by docetaxel with paclitaxel, trastuzumab, and pertuzumab
* ﻿﻿Neratinib
* ﻿﻿Paclitaxel with trastuzumab and pertuzumab
* ﻿﻿Ado-trastuzumab emtansine (TDM-1)
* ﻿﻿Alternative taxanes (ie, docetaxel, paclitaxel, albumin-bound paclitaxel) might be substituted in some cases

﻿﻿An FDA-approved biosimilar or substitute might be used for trastuzumab.

Endocrine therapy is used to treat HR+ breast cancer. Chemotherapy with a HER2-targeted therapy is used to treat HER2+ cancer.

Examples of HER2-targeted therapy used after surgery include trastuzumab and pertuzumab.

Systemic therapies might be used alone or in combination. If chemotherapy is given, it is given before endocrine therapy. Ask your medical oncologist why one treatment might be preferred over another for your type of cancer.

HER2-targeted therapy options can be found in Guide 4.

Endocrine therapy options can be found in

Guide 6.

Guide 5

Adjuvant therapy options: HER2-

Preferred options

Other recommended

Used in some cases

* ﻿﻿Doxorubicin and cyclophosphamide (AC) with paclitaxel
* ﻿﻿Docetaxel and cyclophosphamide (TC)
* ﻿﻿Olaparib, if germline BRCA1 or BRCA2 mutations
* ﻿﻿High-risk triple-negative breast cancer (TNBC): Preoperative pembrolizumab with carboplatin and paclitaxel, followed by preoperative pembrolizumab and cyclophosphamide with doxorubicin or epirubicin, followed by adjuvant pembrolizumab
* ﻿﻿If TNBC and residual disease after preoperative therapy with taxane-, alkylator-, and anthracycline-based chemotherapy, then capecitabine
* ﻿﻿Doxorubicin and cyclophosphamide (AC) with docetaxel
* ﻿﻿Epirubicin and cyclophosphamide (EC)
* ﻿﻿Docetaxel, doxorubicin, and cyclophosphamide (TAG)

Only in certain TNBC cases:

* ﻿﻿Paclitaxel with carboplatin
* ﻿﻿Docetaxel with carboplatin (preoperative only)
* ﻿﻿Doxorubicin and cyclophosphamide (AC)
* ﻿﻿Cyclophosphamide, methotrexate, and fluorouracil (CMF)
* ﻿﻿Doxorubicin and cyclophosphamide (AC) with paclitaxel

﻿﻿Capecitabine (maintenance therapy for TBC after adjuvant chemotherapy)

Guide 6

Endocrine therapy options

Premenopause at diagnosis

Option 1

• Tamoxifen alone or with ovarian suppression or ablation for 5 years

* ﻿﻿After 5 years, if in postmenopause, then an aromatase inhibitor for 5 vears or consider tamoxifen for another 5 ears (for a total of 10 years on tamoxifen)
* ﻿﻿After 5 years, if still in premenopause, then consider tamoxifen for another 5 years (for a total of 10 years on tamoxifen) or stop endocrine therapy

Menopause at diagnosis

Option 2

• Aromatase inhibitor for 5 years with ovarian suppression or ablation, then consider aromatase inhibitor for an additional 3 to 5 ears

Option 1

* ﻿﻿Aromatase inhibitor for 5 years, then consider aromatase inhibitor for 3 to 5 more years
* ﻿﻿Aromatase inhibitor for 2 to 3 years, then tamoxifen to complete 5 years total of endocrine therapy
* ﻿﻿Tamoxifen for 2 to 3 years, then an aromatase inhibitor to complete 5 years of endocrine therapy
* ﻿﻿Tamoxifen for 2 to 3 years, then up to 5 years of an aromatase inhibitor

Option 2

• Tamoxifen for 4.5 to 6 years, then an aromatase inhibitor for 5 years or consider tamoxifen for another 5 years (for a total of 10 years on tamoxifen)

Option 3

• For those who can't have aromatase inhibitors or who don't want aromatase inhibitors, take tamoxifen for 5 years or consider tamoxifen for up to 10 years

HR+ with HER2-

In hormone receptor-positive (HR+) cancer, estrogen (ER+) and/or progesterone receptors (PR+) are found. Endocrine therapy is used to treat HR+ breast cancer. Since there are no HER2 receptors, therapy targeting the HER2 receptors is not used. Sometimes, chemotherapy is used instead. When cancer is found in the lymph nodes, it is node positive (node+).

* ﻿﻿Those who are premenopausal might have ovarian suppression or ablation in addition to endocrine therapy.
* ﻿﻿If chemotherapy is given, it is given before endocrine therapy.

Chemotherapy and other systemic therapies specific to HER2- are found in Guide 5.

Endocrine therapy options can be found in

Guide 6.

HR- with HER2+

In hormone receptor-negative (HR-) cancer, there are no receptors for estrogen (ER-) and progesterone (PR-). When HER2 receptors are found, it is HER2-positive (HER2+). Since this cancer is HR- and HER2+, treatment will focus on targeting HER2. HER2-targeted therapy usually includes chemotherapy. HER2-targeted therapy options can be found in Guide 4.

Triple-negative breast

cancer

In triple-negative breast cancer (TNBC), receptors for estrogen, progesterone, and HER2 are not found. This means that the breast cancer cells have tested negative for

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HER2 and both hormone receptors. It is written as ER- and/or PR- with HER2-.

TNBC is cancer that is:

* ﻿﻿Estrogen receptor-negative (ER-),
* ﻿﻿Progesterone receptor-negative (PR-), and
* ﻿﻿HER2-negative (HER2-).

There are many variations within TNBC. It is a group of diseases that we are learning more about all the time. Since there are no HER2 receptors, HER2- targeted therapy is not used. And since there are no estrogen or progesterone hormone receptors, endocrine therapy is not used. Adjuvant treatment will likely be chemotherapy as found in Guide 5.

Adjuvant endocrine therapy

Adjuvant endocrine therapy is used to treat hormone receptor-positive (HR+) breast cancer. This is cancer that tests positive for estrogen receptors (ER+) and/or progesterone receptors (PR+). Endocrine therapy blocks estrogen and progesterone, which can slow tumor growth or shrink the tumor for a period of time. It might also help prevent the risk of cancer returning in the breasts and elsewhere in the body. If chemotherapy is given, it is given before endocrine therapy.

Those with high-risk breast cancer that is HR+ and HER2- might have 2 years of adjuvant abemaciclib with endocrine therapy.

Those receiving an aromatase inhibitor who are at risk for osteoporosis will likely have bone density tests and bone-strengthening therapy.

Adjuvant endocrine therapy options can be found in Guide 6.

Follow-up care

After treatment, you will receive follow-up care.

During this time, your health will be monitored for side effects of treatment called late effects and the possible return of cancer called recurrence. This is part of your survivorship care plan. It is important to keep any follow-up doctor visits and imaging test appointments.

Seek routine medical care, including regular doctor visits for preventive care and cancer screening.

Tell your care team about any symptoms such as headaches, menstrual spotting between periods or new onset of spotting after menopause (if prior tamoxifen use), shortness of breath that you notice with walking, or bone pain. Side effects can be managed. Continue to take all medicine such as endocrine therapy exactly as prescribed and do not miss or skip doses.

You should receive a personalized survivorship care plan. It will provide a summary of possible long-term effects of treatment and list follow-up tests. Find out how your primary care provider will coordinate with specialists for your follow-up care.

Follow-up care can be found in Guide 7.

Guide 7

Follow-up care

Medical history and physical exam (H&P) 1 to 4 times per year as needed for 5 years, then every

year

Screen for changes in family history

Genetic testing and referral to genetic counseling, as needed

Monitor for lymphedema and refer for lymphedema management, as needed

Mammogram every 12 months (not needed after mastectomy or on reconstructed breast)

Heart tests, as needed

Information on risk of future health issues (comorbidities)

If signs and symptoms of metastases, then blood and imaging tests

If taking endocrine therapy, continue to take endocrine therapy. Do not miss or skip doses

Annual gynecology exam for those on tamoxifen

Bone density tests for those on an aromatase inhibitor or who later have ovarian failure

Maintain an ideal body weight (BMI of 20 to 25), be active, eat a mostly plant-based diet, exercise, limit alcohol, and quit smoking/vaping nicotine

Key points

Surgery is the main or primary treatment for invasive breast cancer. Radiation therapy (RT) and/or systemic therapy are possible following surgery.

* ﻿﻿Treatment after surgery is called adjuvant treatment. It is based on the pathologic stage and other factors. Your tumor will be tested to determine the pathologic stage.
* ﻿﻿Adjuvant systemic therapy is given after surgery to kill any remaining cancer cells in the body and to help prevent the return of cancer.

• Adjuvant treatment is based on the stage, histology, and hormone receptor status. Histology is the study of the anatomy (structure) of cells, tissues, and organs under a microscope.

* ﻿﻿A favorable histology is one that has a favorable or good prognosis.
* ﻿﻿In hormone receptor-positive (HR+) cancer, estrogen (ER+) and/or progesterone receptors (PR+) are found.
* ﻿﻿Endocrine therapy is used to treat HR+ cancer.
* ﻿﻿If chemotherapy is given, it is given before radiation therapy and endocrine therapy.

• In triple-negative breast cancer (TNBC), receptors for estrogen, progesterone, and HER2 are not found. It is almost always treated with chemotherapy.

> It is important to keep follow-up visits and imaging test appointments. Seek good routine medical care, including preventative care and cancer screenings. Continue to take all medicines as prescribed.

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share with us.

Take our survey, and help make the NCCN Guidelines for Patients better for everyone!

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**Rule 1:**

* If a patient has invasive breast cancer, surgery is the primary treatment. Radiation therapy and systemic therapy are possible following surgery(If no preoperative therapy then this method of treatment)

**Rule 3:**

* There are two primary surgical options: lumpectomy (breast-conserving surgery) and total mastectomy.

**Rule 4:**

* Lumpectomy(Breast conserving surgery) may be followed by whole breast radiation therapy (WBRT) and possibly chemotherapy, depending on cancer type and lymph node status. Also regional node Irradiation might be added(If cancer is found in the axilllry lymph nodes[ALN’s] and type of cancer)

**Rule 5:**

* Total mastectomy(The whole breast removed) may be followed by radiation therapy and/or systemic therapy, depending on lymph node status and tumor size.( if cancer was found in the axillary lymph nodes (ALNs), the number of lymph nodes that tested positive, and the size of the removed tumor)

**Rule 6:**

**After Surgery:**

Adjuvant systemic therapy(Drug treatment after surgery or radiation therapy is called adjuvant systemic therapy. It is given to kill any remaining cancer cells and to help reduce the risk of cancer returning.) may be given after surgery or radiation therapy to kill any remaining cancer cells and reduce the risk of cancer recurrence.

**Rule 7:**

* Adjuvant systemic therapy is based on tumor histology, hormone receptor (HR) status, and HER2 status. It may include endocrine therapy, HER2-targeted therapy, or chemotherapy.
* Note : Histology is the study of the anatomy (structure) of cells, tissues, and organs under a microscope

**Rule 8:**

* HR+ cancer, which includes estrogen receptor-positive (ER+) and/or progesterone receptor-positive (PR+) tumors, may receive endocrine therapy.

**Rule 9:**

* HER2+ cancer, with overexpressed HER2 receptors, may receive HER2-targeted therapy in addition to other treatments.

**Rule 10:**

* Triple-negative breast cancer (TNBC), which lacks HER2 and HR receptors, is typically treated with chemotherapy.

**Rule 11:**

* Favorable histology types of breast cancer may have a better prognosis and have less risk of returning and might receive specific treatments.
* . These tumor types are not high grade, are HER2-, and might respond better to treatment than other tumors
* Other systemic therapies are possible.

Favorable histology types include:

* ﻿﻿Pure tubular
* ﻿﻿Pure mucinous
* ﻿﻿Pure cribriform
* ﻿﻿Encapsulated or solid papillary carcinoma (SPC)
* ﻿﻿Adenoid cystic and other salivary carcinomas
* ﻿﻿Secretory carcinoma
* ﻿﻿Rare low-grade forms of metaplastic carcinoma
* ﻿﻿Other rare forms

**Rule 12:**

* Common histology types include ductal/no special type and lobular carcinoma, each with its potential treatments.

Common histology types include:

* ﻿﻿Ductal/no special type (NST) (NST includes medullary pattern, cancers with neuroendocrine expression, and other rare patterns)
* ﻿﻿Lobular
* ﻿﻿Mixed

• Micropapillary

> Metaplastic (includes various subtypes)

Adjuvant treatment options for common histologies are described below Rule 13

**Rule 13:**

* HR+ with HER2+ cancer may receive specific HER2-targeted therapies, such as paclitaxel and trastuzumab.(Details in guide 4,5,6)

**Rule 14:**

* HR+ with HER2- cancer may receive different treatments, which might include endocrine therapy and chemotherapy.( Details page 60)

**Rule 15:**

* HR- with HER2+ cancer focuses on targeting HER2 receptors. Since the treatment is focused on treating HER2, HER2 ussually involves chemotherapy

**Rule 16:**

* Triple negative breats cancer does not have HER2 receptors . Therefore HER2- therapy is not used Since no estrogen and progesterone hormone recptors endocrine therapy is not used . Adjuvalent treatment is chemotherapy for TNBC – Guide 5

**Rule 18:**

* Adjuvant endocrine therapy is used to treat HR+ breast cancer and may include tamoxifen or aromatase inhibitors.

**Rule 19:**

* The duration of endocrine therapy depends on menopausal status and other factors.

**Rule 21:**

* Follow-up care includes physical exams, genetic testing if needed, monitoring for lymphedema, mammograms, heart tests, and maintaining a healthy lifestyle.

Preoptive treatment:

This chapter is for those who have stage 3 breast cancer or for those who would benefit from treatment

before surgery. Treatment before surgery is called preoperative or neoadjuvant therapy. It can be systemic therapy or radiation therapy. Preoperative therapy is not for everyone. Together, you and your care team will choose the best option for you.

Talk with your care team about what types of preoperative therapy are right for you.

In stage 3 breast cancer, the cancer can be large and in the lymph nodes, the lymph nodes can be fixed (or not moveable), or the cancer can involve the skin or chest wall. It is sometimes called advanced disease. It is not metastatic (stage 4).

You will have the following before starting preoperative systemic therapy:

* ﻿﻿Core biopsy of breast
* ﻿﻿Placement of clips or markers to help the surgeon know where to operate in case the tumor goes away with preoperative therapy. Clips are also placed at the time of surgery for radiation planning.
* ﻿﻿Axillary lymph node ultrasound or MRI (if not done before)

• Biopsy of suspicious lymph nodes with clip placement (if not done before

Testing

Not everyone will benefit from preoperative therapy. If preoperative systemic therapy is an option for you, then you will have blood and imaging tests before starting treatment. These tests will determine if your cancer can be removed with surgery (operable) or cannot be removed with surgery at this time (inoperable).

Testing will include an axillary lymph node exam with ultrasound and biopsy of lymph nodes suspected of cancer.

Preoperative therapy

Treatment before surgery is called preoperative or neoadjuvant therapy. It can be systemic (drug) therapy or radiation therapy.

Preoperative systemic therapy is based on hormone receptor (HR) and HER2 status.

Preoperative systemic therapy has benefits.

It can:

* ﻿﻿Help preserve the breast
* ﻿﻿Shrink the tumor
* ﻿﻿Shrink the tumor so it can be removed with a smaller surgery (lumpectomy)

• Provide important information about how your tumor responds to therapy, which is very helpful in those with triple-negative (TNBC) and HER2+ breast cancer

* ﻿﻿Help choose adjuvant regimens in those with HER2+ and TNBC with residual disease
* ﻿﻿Allow time for genetic testing
* ﻿﻿Allow time to plan breast reconstruction in those choosing mastectomy
* ﻿﻿Allow time for fewer lymph nodes to be removed at the time of surgery
* ﻿﻿Allow time for you to decide about and prepare for surgery

There are risks with any treatment. While rare, cancer can still progress during preoperative systemic therapy.

During and after preoperative therapy, you will have tests to monitor treatment.

* ﻿﻿If the tumor shrinks or the cancer burden is reduced, then surgery might be possible. Options are a lumpectomy or mastectomy. Both options include axillary lymph node (ALN) staging. After surgery, a pathologist will examine the removed tissue and any lymph nodes to determine the pathologic stage. Systemic therapy and radiation therapy will follow surgery.
* ﻿﻿If the tumor did not shrink enough to be removed with surgery, then you will have more systemic therapy and/or radiation therapy (RT).

Surgery

Surgery options depend on how your cancer responded to preoperative therapy. A complete response means there is no evidence of cancer. In a partial response, the tumor in the breast or lymph nodes has shrunk in size.

A lumpectomy or mastectomy are options depending on the size and location of the tumor, as well as the size of your breast before surgery. After surgery, most will have both systemic therapy and radiation therapy.

Adjuvant treatment

Many people have treatment after surgery.

Treatment after surgery is called adjuvant therapy. Adjuvant therapy is based on the size of the tumor, if cancer remains (residual disease), and if cancer in the lymph nodes is found. A complete response means there is no evidence of cancer.

Your tumor will be restaged after preoperative therapy. Staging will be done by looking at tissue removed during surgery. This is called the pathologic stage or surgical stage. It might look like this: pTONO. The "y" means you had preoperative therapy.

Hormone receptor-positive (HR+) cancer is often treated with adjuvant endocrine therapy.

HER2-targeted therapy is often used to treat

HER2+ cancer. Systemic therapies might be used alone or in combination. When chemotherapy is used, it is given before endocrine therapy. Ask your medical oncologist why one treatment might be preferred over another for your type of cancer.

For those in menopause (natural or induced) with high-risk node-negative (node-) or node-positive (node+) tumors, bone-strengthening therapy might be given to reduce the risk of distant metastasis.

Adjuvant treatment options are described next.

Order of treatments

Most people with cancer will receive more than one type of treatment. Below is an overview of the order of treatments.

v

Preoperative or neoadjuvant (before) therapy is given to shrink the tumor before a primary treatment such as surgery.

Perioperative therapy is systemic therapy, such as chemotherapy, given before and after surgery.

Primary treatment is the main treatment given to rid the body of cancer.

Postoperative or adjuvant (after)

therapy is given after primary treatment to rid the body of any cancer cells left behind from surgery. It is also used when the risk of cancer returning (recurrence) is felt to be high.

First-line therapy is the first set of systemic (drug) treatment given.

Second-line therapy is the next set of treatment given if cancer progresses during or after systemic therapy.

Talk to your care team about your treatment plan and what it means for your stage and type of cancer.

HR+ with HER2+

Hormone receptor-positive (HR+) with

HER2+ is also called triple-positive breast cancer. Receptors for HER2, estrogen, and/ or progesterone are found. It is treated with HER2-targeted therapy and endocrine therapy.

HER2-targeted therapy options can be found in Guide 8.

Guide 8

Preop and adjuvant HER2-targeted therapy options: HER2+

Preferred options

Other recommended

Used in some cases

Notes

* ﻿﻿Paclitaxel and trastuzumab
* ﻿﻿Docetaxel, carboplatin, and trastuzumab (TCH)
* ﻿﻿Docetaxel, carboplatin, trastuzumab, and pertuzumab (TCHP)

If no residual disease after preoperative therapy or no preoperative therapy.

• Complete up to 1 year of HER2-targeted therapy with trastuzumab. Pertuzumab might be added.

If residual disease after preoperative therapy:

* ﻿﻿Ado-trastuzumab emtansine alone. If ado-trastuzumab emtansine discontinued for toxicity, then trastuzumab with or without pertuzumab to complete one year of therapy.
* ﻿﻿If node positive at initial staging, trastuzumab with pertuzumab
* ﻿﻿Doxorubicin with cyclophosphamide followed by docetaxel with trastuzumab
* ﻿﻿Doxorubicin with cyclophosphamide followed by docetaxel with trastuzumab and pertuzumab
* ﻿﻿Docetaxel, cyclophosphamide, and trastuzumab
* ﻿﻿Doxorubicin and cyclophosphamide followed by paclitaxel with trastuzumab
* ﻿﻿Doxorubicin and cyclophosphamide followed by docetaxel with paclitaxel, trastuzumab, and pertuzumab
* ﻿﻿Neratinib
* ﻿﻿Paclitaxel with trastuzumab and pertuzumab
* ﻿﻿Ado-trastuzumab emtansine (TDM-1)
* ﻿﻿Alternative taxanes (ie, docetaxel, paclitaxel, albumin-bound paclitaxel) might be substituted in some cases
* ﻿﻿An FDA-approved biosimilar or substitute might be used for trastuzumab
* ﻿﻿If no disease remains after preoperative therapy, then you will have endocrine therapy and up to 1 year of HER2-targeted therapy with trastuzumab alone or with pertuzumab.
* ﻿﻿If disease remains after preoperative therapy, then you will have ado-trastuzumab emtansine. If ado-trastuzumab emtansine was discontinued for toxicity, then trastuzumab alone or with pertuzumab will be given to complete 1 year of therapy. Endocrine therapy will be added. Adjuvant neratinib (HER2 inhibitor) may also be considered for high-risk disease.

HR+ with HER2-

Hormone receptor-positive (HR+) breast cancer can be ER+ and/or PR+. It is treated with adjuvant endocrine therapy. Olaparib or abemaciclib might be added in some cases.

HR- with HER2+

Hormone receptor-negative (HR-) breast cancer can be ER- and/or PR-. Since this cancer is HER2+, it is treated with targeted

therapy.

HER2-targeted therapy options can be found in Guide 8.

• If no disease remains after preoperative therapy, then you will complete up to 1 year of HER2-targeted therapy with trastuzumab alone or with pertuzumab.

> If disease remains after preoperative therapy, then you will have ado-trastuzumab emtansine. If ado-trastuzumab emtansine is discontinued for toxicity, then you will receive trastuzumab alone or with pertuzumab to complete 1 year of therapy.

Triple-negative breast cancer

In triple-negative breast cancer (TNBC), the tumor has tested negative for HER2, estrogen receptors, and progesterone receptors. It is written as ER- and/or PR- with HER2-. This cancer does not respond to endocrine therapy or HER2-targeted therapy. It is treated with chemotherapy and other systemic therapies found in Guide 9.

> If no disease remains after preoperative therapy and you are at high risk for

the return of cancer, then you will have pembrolizumab (if a pembrolizumab-containing regimen was given before surgery).

> If disease remains or there is cancer in the lymph nodes (node positive), then you will have capecitabine. Olaparib might be given if a BRA1 or BRCA2 mutation was found. Pembrolizumab is an option if a pembrolizumab-containing regimen was given before surgery.

Guide 9

Preop and adjuvant therapy options: HER2-

Preferred options

Other recommended

Used in some cases

* ﻿﻿Doxorubicin and cyclophosphamide (AC) with paclitaxel
* ﻿﻿Docetaxel and cyclophosphamide (TC)
* ﻿﻿Olaparib, if germline BRCA1 or BRCA2 mutations
* ﻿﻿High-risk triple-negative breast cancer (TNBC): Preoperative pembrolizumab with carboplatin and paclitaxel, followed by preoperative pembrolizumab and cyclophosphamide with doxorubicin or epirubicin, followed by adjuvant pembrolizumab
* ﻿﻿If TNBC and residual disease after preoperative therapy with taxane-, alkylator-, and anthracycline-based chemotherapy, then capecitabine
* ﻿﻿Doxorubicin and cyclophosphamide (AC) with docetaxel
* ﻿﻿Epirubicin and cyclophosphamide (EC)
* ﻿﻿Docetaxel, doxorubicin, and cyclophosphamide (TAC)

Only in certain TNBC cases:

* ﻿﻿Paclitaxel with carboplatin
* ﻿﻿Docetaxel with carboplatin (preoperative only)
* ﻿﻿Doxorubicin and cyclophosphamide (AC)
* ﻿﻿Cyclophosphamide, methotrexate, and fluorouracil (CMF)
* ﻿﻿Doxorubicin and cyclophosphamide (AC) with paclitaxel

﻿﻿Capecitabine (maintenance therapy for TBC after adjuvant chemotherapy)

Adjuvant endocrine therapy

Adjuvant endocrine therapy is used to treat hormone receptor-positive (HR+) breast cancer. This is cancer that tests positive for estrogen receptors (ER+) and/or progesterone receptors (PR+). Endocrine therapy blocks estrogen and progesterone to treat HR+

breast cancer. This can slow tumor growth or shrink the tumor for a period of time. It might also help prevent the risk of cancer returning.

Endocrine therapy is often used with other systemic therapies.

Adjuvant endocrine therapy options can be found in Guide 10.

Guide 10

Endocrine therapy options

Premenopause at diagnosis

Option 1

• Tamoxifen alone or with ovarian suppression or ablation for 5 years

* ﻿﻿After 5 years, if in postmenopause, then an aromatase inhibitor for 5 years or consider tamoxifen for another 5 years (for a total of 10 years on tamoxifen)
* ﻿﻿After 5 years, if still in premenopause, then consider tamoxifen for another 5 years (for a total of 10 years on tamoxifen) or stop endocrine therapy

Menopause at diagnosis

Option 2

• Aromatase inhibitor for 5 years with ovarian suppression or ablation, then consider aromatase inhibitor for an additional 3 to 5 years

Option 1

* ﻿﻿Aromatase inhibitor for 5 years, then consider aromatase inhibitor for 3 to 5 more years
* ﻿﻿Aromatase inhibitor for 2 to 3 years, then tamoxifen to complete 5 years total of endocrine therapy
* ﻿﻿Tamoxifen for 2 to 3 years, then an aromatase inhibitor to complete 5 years of endocrine therapy
* ﻿﻿Tamoxifen for 2 to 3 years, then up to 5 years of an aromatase inhibitor

Option 2

• Tamoxifen for 4.5 to 6 years, then an aromatase inhibitor for 5 years or consider tamoxifen for another 5 years (for a total of 10 years on tamoxifen)

Option 3

• For those who can't have aromatase inhibitors or who don't want aromatase inhibitors, take tamoxifen for 5 years or consider tamoxifen for up to 10 years

Follow-up care

After treatment, you will enter follow-up care.

During this time, your health will be monitored for side effects of treatment and the possible return of cancer called recurrence. This is part of your survivorship care plan. It is important to keep any follow-up doctor visits and imaging test appointments and seek good routine medical care, including regular doctor visits for preventive care and cancer screening.

Tell your care team about any symptoms such as headaches or bone pain. Side effects can be managed. Continue to take all medicine such as endocrine therapy exactly as prescribed and do not miss or skip doses.

You should receive a personalized survivorship care plan. It will provide a summary of possible long-term effects of treatment and list follow-up tests. Find out how your primary care provider will coordinate with specialists for your follow-up care.

Follow-up care can be found in Guide 11.

Guide 11

Follow-up care

Medical history and physical exam (H&P) 1 to 4 times per year as needed for 5 years, then every year

Screen for changes in family history

Genetic testing and referral to genetic counseling, as needed

Monitor for lymphedema and refer for lymphedema management, as needed

Mammogram every 12 months (not needed after mastectomy or on reconstructed breast)

Heart tests, as needed

Information on risk of future health issues (comorbidities)

If signs and symptoms of metastases, then blood and imaging tests

If taking endocrine therapy, continue to take endocrine therapy. Do not miss or skip doses

Annual gynecology exam for those on tamoxifen

Bone density tests for those on an aromatase inhibitor or who later have ovarian failure

Maintain an ideal body weight (BMI of 20 to 25), be active, eat a mostly plant-based diet, exercise, limit alcohol, and quit smoking/vaping nicotine

More information on breast cancer screening is available at NCCN.org/patientguidelines and on the NCCN Patient Guides for Cancer app.

NOON Guidelines for Patients\*

Breast Cancer

Screening and

Diagnosis

* ﻿﻿HER2-positive (HER2+) breast cancer is treated with HER2-targeted therapy.
* ﻿﻿It is important to keep follow-up visits and imaging test appointments. Seek good routine medical care, including preventative care and cancer screenings. Continue to take all medicines as prescribed.

Key points

* ﻿﻿In stage 3 breast cancer, the cancer can be large and in the lymph nodes, the lymph nodes can be fixed (or not moveable), or the cancer can involve the skin or chest wall. It is not metastatic.
* ﻿﻿Treatment before surgery is called preoperative (neoadjuvant) therapy. It can be systemic therapy or radiation therapy. The goal of treatment is to shrink the tumor before surgery.
* ﻿﻿Systemic therapy after surgery is called adjuvant therapy. Adjuvant therapy is based on how the tumor responded to preoperative treatment.
* ﻿﻿All treatment is based on HER2 and hormone receptor (HR) status.
* ﻿﻿In hormone receptor-positive (HR+) breast cancer, tests find hormone receptors for estrogen and/or progesterone on the tumor.

﻿﻿HR+ breast cancer is treated with endocrine therapy.

**Rule 1: Identifying Stage 3 Breast Cancer:**

* IF the cancer is large AND in the lymph nodes OR the cancer involves the skin or chest wall,
* THEN classify it as Stage 3 breast cancer.

**Rule 2: Preoperative Therapy Options:**

* IF the patient has Stage 3 breast cancer,
* THEN discuss preoperative therapy options, including systemic therapy or radiation therapy.

Rule 2 : Testing

If preoperative systemic therapy

then will have blood and imaging tests before starting treatment. These tests will determine if your cancer can be removed with surgery (operable) or cannot be removed with surgery at this time (inoperable).

Testing will include an axillary lymph node exam with ultrasound and biopsy of lymph nodes suspected of cancer.

**Rule 3: Preoperative Testing:**

* IF considering preoperative therapy,
* THEN conduct core biopsy of the breast, place clips or markers for surgical guidance, and perform an axillary lymph node exam.

**Rule 4: Determining Operability:**

* IF preoperative therapy is an option,
* THEN conduct blood and imaging tests to determine if the cancer can be surgically removed (operable) or not (inoperable).

**Rule 5: Preoperative Systemic Therapy Options**

**Note - treatment before surgery is called preoperative therapy:**

* IF opting for preoperative therapy and considering systemic(which is drug therpaty} therapy,
* THEN choose the therapy based on hormone receptor (HR) and HER2 status.

**Rule 6: Benefits of Preoperative Systemic Therapy:**

* IF considering preoperative systemic therapy,
* THEN its benefits:
* Help preserve the breast
* ﻿﻿Shrink the tumor
* ﻿﻿Shrink the tumor so it can be removed with a smaller surgery (lumpectomy)

• Provide important information about how your tumor responds to therapy, which is very helpful in those with triple-negative (TNBC) and HER2+ breast cancer

* ﻿﻿Help choose adjuvant regimens in those with HER2+ and TNBC with residual disease
* ﻿﻿Allow time for genetic testing
* ﻿﻿Allow time to plan breast reconstruction in those choosing mastectomy
* ﻿﻿Allow time for fewer lymph nodes to be removed at the time of surgery
* ﻿﻿Allow time for you to decide about and prepare for surgery

.

**Rule 7: Monitoring Treatment Response:**

* IF undergoing preoperative therapy,
* THEN schedule regular tests to monitor the tumor's response.

**Rule 8: Postoperative Surgery Options:**

* IF the tumor shrinks or the cancer burden is reduced after preoperative therapy,
* THEN consider surgery options, including lumpectomy or mastectomy, followed by systemic and radiation therapy.
* Else if tumor did not shrink enough to be removed with surgery
* Then more systemic therapy and /or radiation therapy

**Rule 9: Adjuvant Treatment(tretament after surgery)**

* IF cancer remains after surgery or if there's residual disease,
* THEN discuss adjuvant therapy based on tumor characteristics.

**Rule 10: Pathologic Staging After Preoperative Therapy:**

* IF the tumor responded to preoperative therapy,
* THEN restage the cancer after surgery and classify it using pathologic staging.

**Rule 11: Hormone Receptor-Positive (HR+) Cancer Treatment:**

* IF the cancer is HR+,
* THEN consider adjuvant endocrine therapy.

**Rule 12: HER2-Positive (HER2+) Cancer Treatment:**

* IF the cancer is HER2+,
* THEN discuss HER2-targeted therapy options, including trastuzumab and pertuzumab.

**Rule 13: Triple-Negative Breast Cancer (TNBC) Treatment:**

* IF the cancer is triple-negative (ER-, PR-, HER2-),
* THEN treat with chemotherapy and other systemic therapies found in Guide 9.

**Rule 14: Treatment Order and Types☹Check this rule**

* IF considering preoperative therapy, perioperative therapy, or postoperative therapy,
* THEN follow the treatment order, including primary treatment, postoperative therapy, first-line therapy, and second-line therapy, as appropriate.

**Rule 15: Follow-Up Care:**

* IF treatment is completed,
* THEN enter follow-up care, which includes regular medical exams, imaging tests, and adherence to prescribed therapies.