Breast Cancer Updates

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Stephanie Martinez, APRN

2023

Petree, 2020

Breast Cancer Epidemiology

- Most common cancer in women worldwide
  - > 2.3 million new cases worldwide in 2020 (Global Cancer Statistics 2020)
- In U.S.
  - 297.790 new cases invasive breast cancer (1:8 lifetime risk) in women (ACS, 2022)
    - *Accounts for 29% of new cancer diagnosis in women*
  - 2,800 new cases in men (ACS, 2022)
  - 55,720 cases stage 0: ductal carcinoma in situ (DCIS) (ACS, 2021)
  - With the exception of pleomorphic LCIS, LCIS is no longer considered a precursor to invasive breast cancer
    - Per changes to the eight edition of TNM classification
  - 43,250 expected deaths (ACS, 2023)
    - *2nd leading cause of cancer-related death in females, second only to lung cancer*

Petree, 2020; Sung, H. 2020

Figure 3. Leading Sites of New Cancer Cases and Deaths – 2021 Estimates

Estimated New Cases

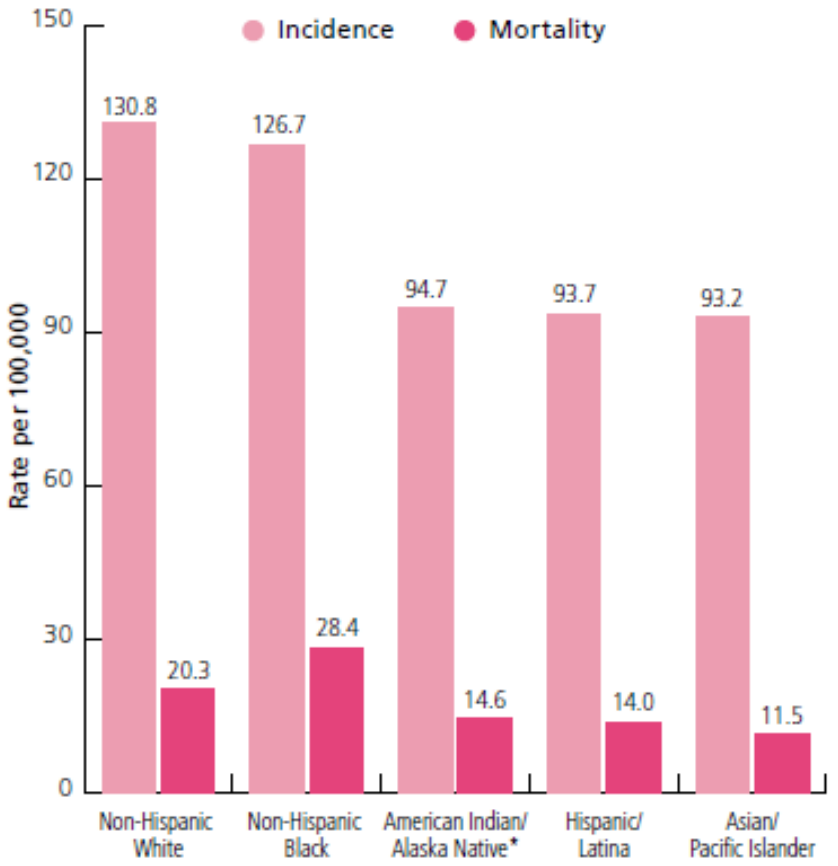
Male			Female		
Prostate	248,530	26%	Breast	281,550	30%
Lung & bronchus	119,100	12%	Lung & bronchus	116,660	13%
Colon & rectum	79,520	8%	Colon & rectum	69,980	8%
Urinary bladder	64,280	7%	Uterine corpus	66,570	7%
Melanoma of the skin	62,260	6%	Melanoma of the skin	43,850	5%
Kidney & renal pelvis	48,780	5%	Non-Hodgkin lymphoma	35,930	4%
Non-Hodgkin lymphoma	45,630	5%	Thyroid	32,130	3%
Oral cavity & pharynx	38,800	4%	Pancreas	28,480	3%
Leukemia	35,530	4%	Kidney & renal pelvis	27,300	3%
Pancreas	31,950	3%	Leukemia	25,560	3%
All sites	970,250		All sites	927,910	

Estimated Deaths

Male			Female		
Lung & bronchus	69,410	22%	Lung & bronchus	62,470	22%
Prostate	34,130	11%	Breast	43,600	15%
Colon & rectum	28,520	9%	Colon & rectum	24,460	8%
Pancreas	25,270	8%	Pancreas	22,950	8%
Liver & intrahepatic bile duct	20,300	6%	Ovary	13,770	5%
Leukemia	13,900	4%	Uterine corpus	12,940	4%
Esophagus	12,410	4%	Liver & intrahepatic bile duct	9,930	3%
Urinary bladder	12,260	4%	Leukemia	9,760	3%
Non-Hodgkin lymphoma	12,170	4%	Non-Hodgkin lymphoma	8,550	3%
Brain & other nervous system	10,500	3%	Brain & other nervous system	8,100	3%
All sites	319,420		All sites	289,150	

Estimates are rounded to the nearest 10, and cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder. Estimates do not include Puerto Rico or other US territories. Ranking is based on modeled projections and may differ from the most recent observed data.

Figure 3. Female Breast Cancer Incidence (2012-2016) and Death (2013-2017) Rates by Race/Ethnicity, US



*Statistics based on data from PRCDA counties. Note: Rates are per 100,000 and age adjusted to the 2000 US standard population.

Sources: Incidence – NAACCR, 2019. Mortality – National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, 2019.

Petree, 2020

Breast Cancer Epidemiology

- Steady decline in mortality due to earlier detection and treatment improvement
  - Mortality rate decline has slowed in recent years to 1.3% (2011 - 2020) versus 1.9% (2002 - 2011)
- Poorer outcomes for
  - African Americans
    - *40% higher mortality for Black women vs white women despite a lower incidence rate*
    - *Leading cause of cancer-related mortality in females*
  - Hispanics
  - Hawaiians
  - Filipinos

Petree, 2020; Giaquinto, 2022

Breast Cancer Epidemiology

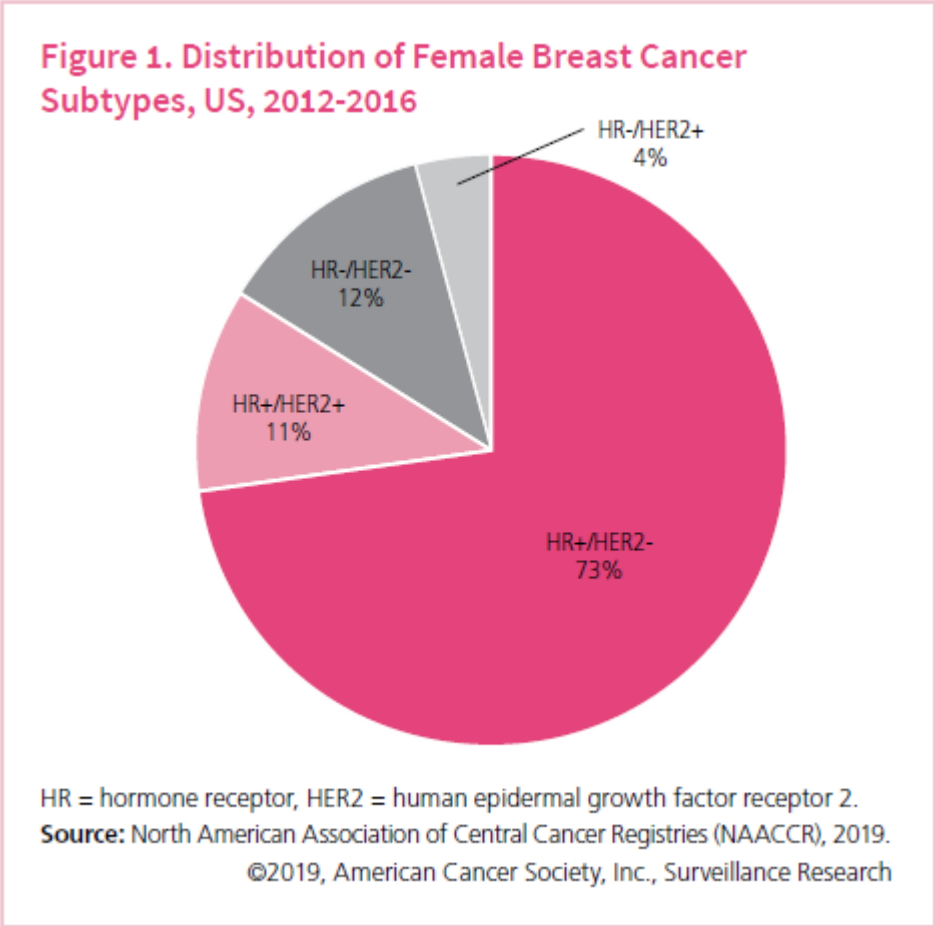
Table 1. Estimated New DCIS and Invasive Breast Cancer Cases and Deaths among Women by Age, US, 2019

	DCIS cases		Invasive cases		Deaths	
Age	**Number**	**%**	**Number**	**%**	**Number**	**%**
<40	1,180	2%	11,870	4%	1,070	3%
40-49	8,130	17%	37,150	14%	3,250	8%
50-59	12,730	26%	61,560	23%	7,460	18%
60-69	14,460	30%	74,820	28%	9,920	24%
70-79	8,770	18%	52,810	20%	8,910	21%
80+	2,830	6%	30,390	11%	11,150	27%
All ages	**48,100**		**268,600**		**41,760**	

Estimates are rounded to the nearest 10. Percentages may not sum to 100 due to rounding.

Petree, 2020

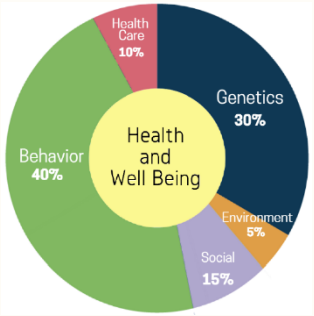
Breast Cancer Sub-types



- Majority of breast cancers are hormone receptor positive

Petree, 2020

Breast Cancer
Non-modifiable Risk Factors

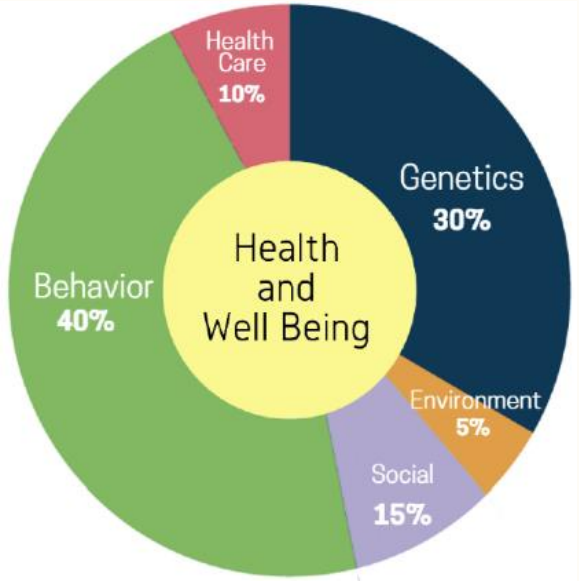


- Family history of breast cancer
  - 1st degree relative (mother, father, sister, daughter) highest risk
- Female gender
- Age
  - Only 5% of women are less than age 40
  - 60% are older than age 60
  - Median age is 62
  - Rate declines after 75
- Race and ethnicity
  - White women 1:8
  - African American 1:10
    - *More African American are diagnosed <45 years old*
- Breast Density
- Non-cancerous breast diseases
- Reproductive and hormonal factors
  - Late age first full-term pregnancy i.e. first child after age 30
  - Number of births
    - *Lower risk with higher number of births*
- Breastfeeding decreases risk
- Nulliparity
- Age of menopause/menarche
- Post-thoracic radiation to chest e.g. Hodgkin or Non-Hodgkin lymphoma

Petree, 2020

Breast Cancer Modifiable Risk Factors

- Diet high in polysaturated fat
  - Monosaturated fats e.g. olive oil may be protective
- Obesity or weight gain after menopause
  - Decreased risk with premenopausal status
- Alcohol intake
  - 30% increase risk with 3-4 drinks/day
- Smoking
- Lack of physical activity
  - Reduction 20-80% with exercise
- Use of hormonal replacement therapy, oral contraceptives (including progesterone only), or both



Petree, 2020

Breast Cancer Genetic Factors

- BRCA-1 gene mutation
  - 50-85% lifetime risk
- BRCA-2 gene mutation
  - 50-85% lifetime risk
- TP53 Li Fraumeni syndrome
- ATM (ataxia telangiectasia mutated)
- PTEN: Cowden's Disease
- STK11/LKB: Peutz-Jeghers syndrome
- CHEK2: cell cycle checkpoint kinase gene
- Lynch Syndrome
- PALB2: makes partner and localizer protein of BRCA-2
- BRIP1: BRCA-1 interacting protein gene
- RAD51C and RAD51D
- RAD50
- NBN and NFI, BARD1
- MRE11A
- CDH1

NCCN, 2020; Petree, 2020

Breast Cancer Screening Guidelines

ACS - 2021	NCCN - 2021	USPSTF - 2016
Age 40-44 : Optional annual mammography **45-54:** annual mammogram **55+:** Mammogram q2 yrs. or choice to continue annually if in good health or 10+ years life expectancy	**Age ≥25 - <40 yr.:** Clinical Encounter q1-3 yrs. Includes: Clinical breast exam Risk assessment Risk reduction education **Age ≥40** Annual clinical encounter & mammogram (Consider tomosynthesis 3D imaging) Risk reduction education	**Age <50** – Individual informed decision mammogram q2 year option versus annually **50-74 :** mammogram q2 yr

References: American Cancer Society (ACS); National Comprehensive Cancer Network (NCCN); US Preventive Services Task Force (USPSTF)

Breast Cancer Classifications

- Ductal adenocarcinoma
  - 70-80% breast cancer cases
  - Invasive ductal carcinoma (IDC) most common
  - Subtypes vary depending on morphology, estrogen (ER), progesterone (PR), Ki67 (marker of cell proliferation, and HER-2Neu overexpression)
- Lobular carcinoma
  - 10-15% breast cancer cases
  - Invasive lobular carcinoma (ILC) capable of metastasis - outcomes similar to IDC
  - More likely to affect bilateral breasts

Petree, 2020

Staging

- History and physical
- Bilateral diagnostic mammography
- Breast ultrasound to differentiate solid mass from cyst
- Labs: CBC and LFTs
- CT of chest, if symptomatic (cough, dyspnea)
- MRI, optional
  - Assess for breast conserving surgery
- Pathology staging
  - Estrogen receptors (ER)
  - Progesterone receptors (PR)
  - Human epithelial growth factor (HER2)

NCCN, 2021

Workup

- Genetic counseling for patients high risk for hereditary breast cancer
- Emotional Distress Screening (Patient Health Questionnaire 7)
  - Impending risk to body image
  - Young patients have higher rates psychosocial distress than older women
- Fertility counseling
  - Child-bearing after treatment for invasive breast cancer does not increase rates of recurrence or death from breast cancer
  - Offspring do not have increased birth defects or serious childhood illness
  - Many women, younger than age 35 regain menstrual function within 2 year of competing chemotherapy
    - *Counsel patient to avoid pregnancy while receiving RT, chemotherapy, endocrine therapy or within 6 months of receiving pertuzumab or trastuzumab*
  - Resumption of menses does not correlate with fertility and fertility may be preserved without menses

NCCN, 2021

Clinical Staging
American Joint Committee on Cancer (AJCC)

- Tumor size (T), Lymph Nodes (N), and Metastasis (M) determines the extent of disease
  - Stage 0-4
- AJCC 8th edition now recognizes intrinsic tumor biology
  - Clinical
  - Biomarkers
  - Anatomic markers

Petree, 2020; AJCC, 2017

Breast Cancer Histologic Grade

- Bloom-Richardson or Nottingham grading system
- Grade 1: low grade or well differentiated
- Grade 2: intermediate grade or moderately differentiated
- Grade 3: high grade or poorly differentiated

Petree, 2020

Table 4: Anatomic Staging Summary

Stage	TNM
Stage 0	Tis, N0, M0
Stage IA	T1, N0, M0
Stage IB	T0, N1mi, M0
	T1, N1mi, M0
Stage IIA	T0, N1, M0
	T1, N1, M0
	T2, N0, M0
Stage IIB	T2, N1, M0
	T3, N0, M0
Stage IIIA	T0, N2, M0
	T1, N2, M0
	T2, N2, M0
	T3, N1, M0
	T3, N2, M0
Stage IIIB	T4, N0, M0
	T4, N1, M0
	T4, N2, M0
Stage IIIC	Any T, N3, M0
Stage IV	Any T, Any N, M1

Kalli, 2018

Breast Cancer Surgery Treatment Options

- Stage 1, IIA, or IIB disease or T3 N1 M0

A. Lumpectomy with surgical axillary node staging followed by
   - *Possible radiation therapy (RT)*
     - Risk and benefit discussion with RT oncologist
   - *Possible chemotherapy for high risk patients*
   - *Antihormonal therapy*

B. Total mastectomy with surgical axillary staging with or without reconstruction
   - *Consider chemotherapy followed by RT for those with close margin of <1 mm, positive margins, and/or positive lymph nodes*
   - *Breast reconstruction at same time of surgery or at some time after completion of treatment*

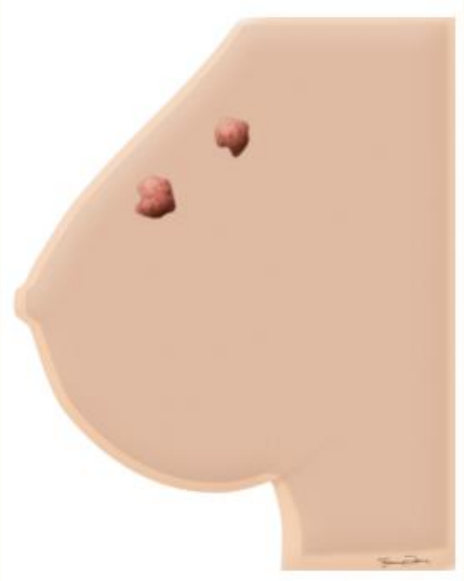
Petree, 2020

Breast Cancer

Multifocal Disease

Confined to one quadrant

- Breast conservation surgery option

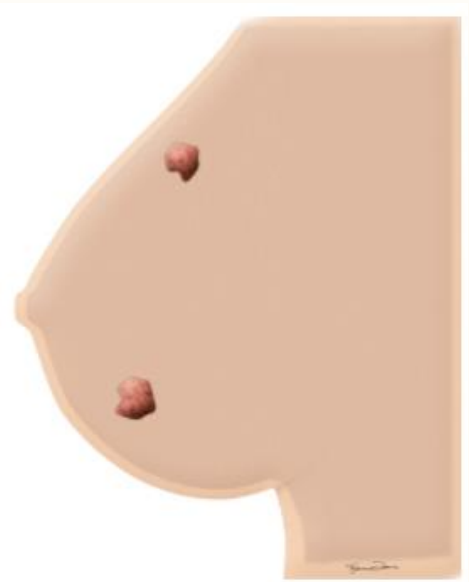


https://pubs.rsna.org/doi/10.1148/rg.2018180056

Multicentric Disease

More than ¼ of breast

Mastectomy required



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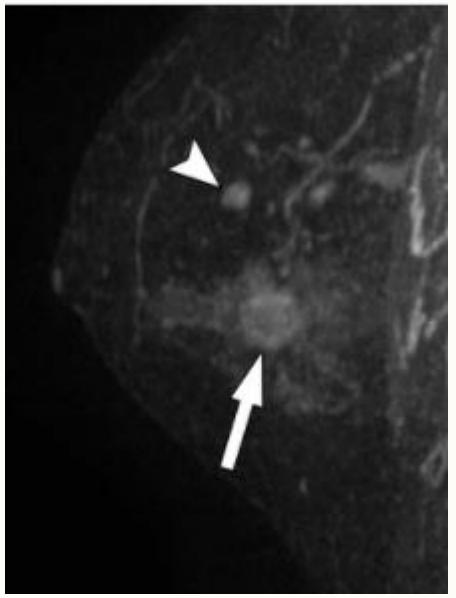

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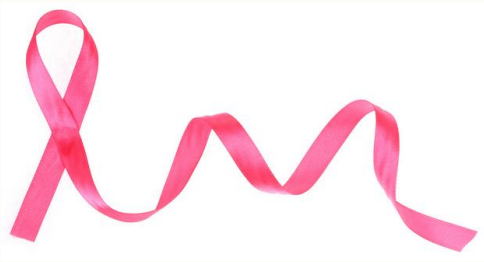
Breast Reconstruction Options

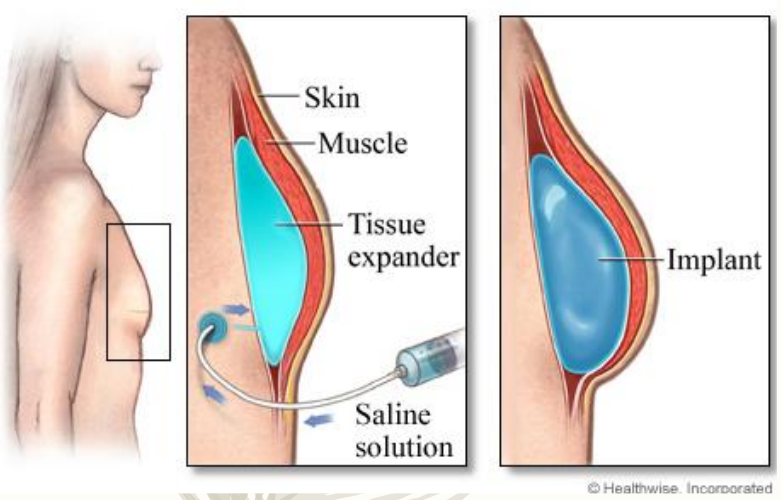
- **Implant only**
  - **most common form of reconstruction**
- Tissue expanders with implants later
- Latissimus dorsi alone or with implants
- Transverse rectus abdominis muscle (TRAM) flap
  - Contraindications include:
    - *History of smoking*
    - *Obesity*
    - *Previous RT to surgical site*
- Free flap from gluteal flap

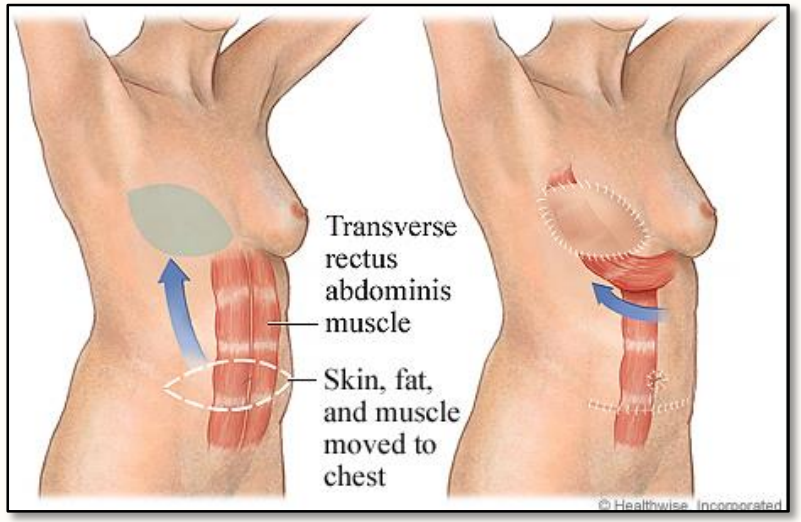
FDA takes action to protect patients from risk of certain textured breast implants; requests Allergan voluntarily recall certain breast implants and tissue expanders from market

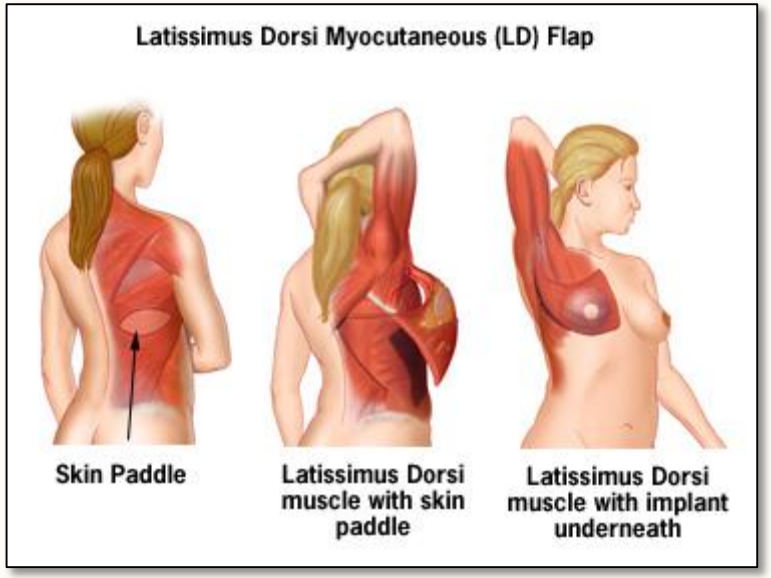


Petree, 2020

Breast Reconstruction Options

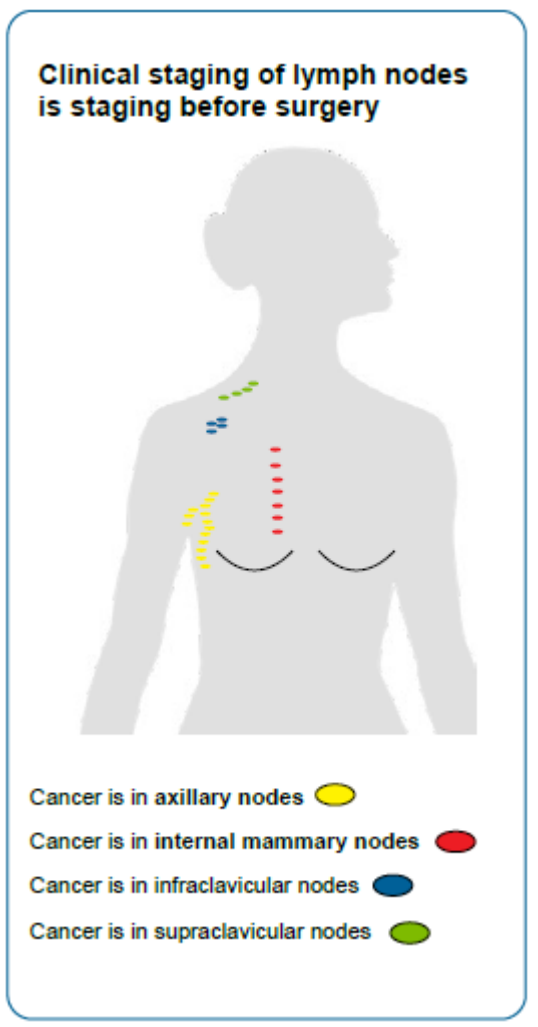






Petree, 2020

Axillary Node Staging



- Sentinel lymph node biopsy preferred method
  - <1% risk lymphedema
  - May be more than one node as sentinel
  - Avoids total axillary lymph node dissection
- Axillary Node Dissection performed if
  - sentinel lymph node is positive at time of surgery
  - Palpable axillary nodes on exam and biopsy-prove positive lymph nodes in axilla

Petree, 2020

NCCN Guidelines for Patients. Invasive Breast Cancer, 2020

Breast Cancer Surgery
Post-op Complications

- Infection, seroma and hematoma at the incision site
- Lymphedema
- Nerve damage may cause "phantom" sensations long term
- Diminished ability for arm and shoulder movement on the operative side as well as chest wall tightness as a result of altered venous and lymphatic drainage
- Early postoperative exercise program to enhance arm and shoulder range of motion should begin within 24 hours and progress as tolerance allows

Petree, 2020

Radiation Therapy

- RT dosing

Regimen	Method	Reference
30 Gy/5 fractions QOD (preferred)	External beam RT (EBRT)[a]	Livi L, Meattini I, Marrazzo L, et al. Accelerated partial breast irradiation using intensity-modulated radiotherapy versus whole breast irradiation: 5-year survival analysis of a phase 3 randomised controlled trial. Eur J Cancer 2015;51:451-463. Meattini I, Marrazzo L, Saieva C, et al. Accelerated partial-breast irradiation compared with whole-breast irradiation for early breast cancer: Long-term results of the randomized phase III APBI-IMRT-Florence Trial. J Clin Oncol 2020;38:4175-4183.
40 Gy/15 fractions	EBRT	Coles CE, Griffin CL, Kirby AM, et al. Partial-breast radiotherapy after breast conservation surgery for patients with early breast cancer (UK IMPORT LOW trial): 5-year results from a multicentre, randomised, controlled, phase 3, non-inferiority trial. Lancet 2017;390:1048-1060.
34 Gy/10 fractions BID	Balloon/ Interstitial	Vicini FA, Cecchini RS, White JR, et al. Long-term primary results of accelerated partial breast irradiation after breast-conserving surgery for early-stage breast cancer: a randomised, phase 3, equivalence trial. Lancet 2019;394:2155-2164.
38.5 Gy/10 fractions BID	EBRT	Whelan TJ, Julian JA, Berrang TS, et al. External beam accelerated partial breast irradiation versus whole breast irradiation after breast conserving surgery in women with ductal carcinoma in situ and node-negative breast cancer (RAPID): a randomised controlled trial. Lancet 2019;394:2165-2172.

NCCN, 2021

Adjuvant Endocrine Therapy Options

- For ER+ and/or PR+ positive

A. Premenopausal: selective estrogen modulator
  - Tamoxifen for 5-10 years with or without ovarian suppression or ablation
    - *Adverse effects: hot flashes, vaginal dryness, decreased libido, blood clots and uterine cancer*
  - If ovarian suppression or ablation may use an aromatase inhibitor eg. anastrozole, letrazole, exemestane
    - *Adverse effects: hot flashes, arthralgia, myalgia, osteopenia, dry skin, vaginal dryness, decreased libido*

Petree, 2020

Adjuvant Endocrine Therapy Options

B. Postmenopausal at diagnosis

- aromatase inhibitor for 5 years eg. anastrozole, letrazole, exemestane
- AI optional length is up to 10 years
- Addition of tamoxifen for total of 10 years
- Unclear of sequence of tamoxifen or AI first for 2-3 years then switching over to other drug to complete 5-10 years of therapy
- Benefit is adding AI to treatment

Petree, 2020

Benefit of Extended ET

- Breast Cancer Index (BCI) – gene expression-based signature comprised of two biomarker panels that evaluate tumor proliferation and estrogen signaling.
  - Predicts benefit of additional 5 years endocrine therapy
  - aTTom trial showed a 3.8% absolute benefit of disease free interval with 10 versus 5 years of tamoxifen treatment.
- Patient categorized as BCI high derived a much more significant decrease in the risk of late recurrence of 10.2%
- Patient classified as BCI low showed no significant benefit from extended endocrine therapy.

Bartlett et al., 2019

Adding a CDK4/6 inhibitor in the adjuvant setting

- NATALEE – adding ribociclib in the adjuvant setting for early breast cancer along with endocrine therapy significantly reduced patients' risk of recurrence
- Inclusion criteria: stage IIA that are node positive IIB or III disease
  - Stage IIA (N0) with risk factors of G3 tumor or G2 with high Ki67 >20%
- monarchE
  - Adding abemaciclib in adjuvant setting
  - Already approved by FDA for patient at high risk of recurrence

Slamon, 2023;

Gene Expression Assays

- Provide prognostic and therapy-predictive information
- Oncotype DX is 21-gene assay preferred by NCCN Breast Cancer Panel
- RxPonder trial – premenopausal women with 1 – 3 + LN benefitted from adjuvant chemoendocrine therapy when their RS score was < 26
  - Adding chemo to ET lowered rate of distant recurrent. Unclear if benefit is from ovarian suppression effects of chemotherapy

Exploratory Subgroup Analysis for TAILORx and NSABP B-20:
Absolute CT Benefit for Distant Recurrence by Age and RS Result

Age	RS 0-10	RS 11-15	RS 16-20	RS 21-25	RS 26-100
>50 years	No CT Benefit (<1%)				>15% CT Benefit
≤50 years	No CT Benefit (<1%)		~1.6% CT Benefit	~6.5% CT Benefit	>15% CT Benefit

Petree, 2020

GENE EXPRESSION ASSAYS FOR CONSIDERATION OF ADJUVANT SYSTEMIC THERAPY[a,b]

Assay	Recurrence Risk	Treatment Implications
21-gene (Oncotype Dx) for postmenopausal patients with pN0 and pN1 (1–3 positive nodes)[c]	<26	Patients with T1b/c–2, pN0, HR-positive, HER2-negative tumors, with risk scores (RS) between 0–10 have a risk of distant recurrence of <4% and those with RS 11–25, derived no benefit from the addition of chemotherapy to endocrine therapy in the prospective TAILORx study.[1] Postmenopausal patients with pT1–3, pN1, HR-positive, HER2-negative, with RS <26 derived no benefit from the addition of chemotherapy to endocrine therapy in the prospective RxPONDER study.[2]
	≥26	In postmenopausal patients with pT1–3, HR-positive, HER2-negative, and pN0 and pN1 (1–3 positive nodes) tumors and an RS ≥26, the addition of chemotherapy to endocrine therapy is recommended.[1,2]
21-gene (Oncotype Dx) (for premenopausal patients: pN0)	≤15	Premenopausal patients with T1b/c –2, pN0, HR-positive, HER2-negative tumors with RS <16 derived no benefit from the addition of chemotherapy to endocrine therapy in the prospective TAILORx study.[1]
	16–25	In premenopausal patients with RS between 16–25, a small benefit from the addition of chemotherapy could not be ruled out, but it is unclear if the benefit was due to the ovarian suppression effect promoted by chemotherapy in premenopausal patients.[1,2] For this group, consider chemotherapy followed by endocrine therapy or alternatively, ovarian function suppression combined with either tamoxifen or an AI.
	≥26	In premenopausal patients with HR-positive, HER2-negative, and pN0 tumors and an RS ≥26, the addition of chemotherapy to endocrine therapy is recommended.[1]
21-gene (Oncotype Dx) (for premenopausal patients with 1–3 positive nodes)[c]	<26	In premenopausal patients with pT1–3 and pN1 (1–3 positive nodes) tumors and an RS <26, the addition of chemotherapy to endocrine therapy was associated with a lower rate of distant recurrence compared with endocrine monotherapy[2] but it is unclear if the benefit was due to the ovarian suppression effects promoted by chemotherapy. For this group of patients, consider chemotherapy followed by endocrine therapy or alternatively, ovarian function suppression combined with either tamoxifen or an AI.[2]
	≥26	In premenopausal patients with HR-positive, HER2-negative, pT1–3 and pN1 (1–3 positive nodes) tumors and an RS ≥26, the addition of chemotherapy to endocrine therapy is recommended.[2]

[a] Gene expression assays provide prognostic and therapy-predictive information that complements T,N,M and biomarker information. Use of these assays is not required for staging. The 21-gene assay (Oncotype Dx) is preferred by the NCCN Breast Cancer Panel for prognosis and prediction of chemotherapy benefit. Other prognostic gene expression assays can provide prognostic information but the ability to predict chemotherapy benefit is unknown.

[b] See Special Considerations for Breast Cancer in Men (Sex Assigned Male at Birth) (BINV-J).

[c] In the overall study population of the RxPONDER trial, 10.3% had high grade disease and 9.2% had 3 involved nodes.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

References

Chemotherapy Agents Preferred Regimens

- Liposomal doxorubicin
- Dose-dense AC: doxorubicin and cyclophosphamide x 4 cycles followed by paclitaxel every 2 weeks x 4 cycles
- AC followed by weekly paclitaxel
- TC: docetaxel and cyclophosphamide
- Taxanes: paclitaxel and docetaxel , nabpaclitaxel
- Docetaxel, carboplatin, and HER2+ only: trastuzumab
- Capecitabine or gemcitabine
- Vinorelbine or eribulin

Petree, 2020; NCCN, 2021

Chemotherapy Agents HER2+ Regimens

- AC followed by weekly paclitaxel plus trastuzumab or AC followed by trastuzumab and docetaxel
- THC: Docetaxel, carboplatin, and trastuzumab
- Trastuzumab, pertuzumab, carboplatin and docetaxel (metastatic disease)
- Lapatinib: kinase inhibitor
  - In combination with chemotherapy
- Ado-trastuzumab emansine (t-dm1):
  - Inhibits HER2 receptor signaling

Petree, 2020; NCCN, 2021

HER2 Low

- New therapeutic subtype
  - Rethinks the binary classification of HER2+ vs HER2-
- IHC1+ or 2+ and ISH Negative
- Mostly hormone receptor positive patients ~ 40 – 50% of breast cancer patients
- Trastuzumab deruxtucan – antibody drug conjugate
- DESTINY-Breast04, phase 3 study for T-DXd in mBC
  - HER2low patients randomized to received T-DXd or TPC
  - PFS 5.1 mo in TPC vs 9.9 mo in T-DXd; OS 16.8 mo in TPC vs 23.4 mo in T-DXd

McArthur, H 2023; Modi et al, NEJM 2022

Updates for Advanced Breast Cancer

- DESTINY- Breast 01, 02, 03
  - efficacy of trastuzumab deruxtecan in >65 patients is generally similar to patients < 65
- TROPICS-02
  - Sacituzumab govitecan: Used after multiple lines of treatment
- HER3
  - Anticipate to be adding paritumab deruxtecan in treating metastatic breast cancer
- SONIA
  - Phase III trial from Netherlands
  - Adding CK4/6 inhibitor as first versus second line therapy in advanced breast cancer.

Sonke et al, 2023; Rugo et al., 2022; ASCO 2023

Nursing Care Decision Making

- Treatment options are complex with every treatment modality
  - Patient and family decision making style is important to understand
    - *Active: patient controlled*
      - Prefers to make final decision
    - *Collaborative: Jointly Controlled*
      - Oncologist/physician and patient decides on best treatment
    - *Provider Controlled*
      - Prefers to leave all decisions to oncologist/physician
- Support treatment decisions and options in a nonjudgmental way
  - Encourage involvement in treatment decision making
  - Encourage discussion regarding physical and emotional changes due to treatment

Petree, 2020

Nursing Care Education

- Lymphedema
  - Measure circumference of affected arm and report changes
    - *Teach precautions to prevent trauma and infection which can lead to lymphedema*
- Paresthesia of arm and breast
  - Numbness, tingling, phantom breast sensation after mastectomy that may be indefinite after surgery
- Menopausal symptoms
  - Hot flashes and vaginal dryness associated with adjuvant endocrine therapy or chemotherapy-induced ovarian failure
- Monitoring for and managing side effects of surgery, RT, biotherapy and chemotherapy

Petree, 2020

Nursing Care
Self-care Education

- Assess for emotional distress, coping skills and support system
  - body image, sexually identity, and role relationships
- Provide patient information as appropriate
  - Disease, treatment, coping, and support resources
    - *Refer to Social Worker, Dietician*
- Healthy lifestyle living
  - Diet, activity, and stress reduction
- Survivorship
  - Personalized treatment plan including personalized treatment summary of possible long-term toxicity and clear follow-up recommendations
  - Support groups
  - Access to electronic medical system e.g. MyChart

Petree, 2020

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