# Advanced Oncology Certified Nurse Practitioner

**REVIEW COURSE 2024** 

October 10-12, 2024 | Houston, TX

MDAnderson Cancer Center

Making Cancer History\*

# **Breast Cancer**

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Making Cancer History\*

- No Financial Disclaimers
- No promotion of a Commercial Interest's
- Presentation contributes to the Quality and Improvement in Healthcare & services



## Outline

- Signs & Symptoms
- Imaging
- Diagnostic Procedures
- Pathology
- Cancer Biomarkers

- Staging & Grading
- Systemic Therapy
- Surgery
- Radiation





## Breast Cancer – Epidemiology

- Most common cancer diagnosed among women in US
- Second leading cause of death from cancer among women
- 1 in 8 will develop breast cancer
- Incidence increases with age
- Median age at diagnosis is 62
- In 2024, 310,720 new cases among women & 2800 among men (ACS)
- Estimated 42,250 US women will die from breast cancer in 2024(ACS)



## Anatomy



## Breast Cancer – Signs & Symptoms

- Palpable mass
  - Onset: When was the lump first noticed?
  - Via Patient
  - Via Clinician
  - Routine Screening mammogram
  - Duration? Has it changed over time?
- Location:
  - Right or Left or Both (laterality)
  - Upper Outer, Upper inner, Lower inner, Lower outer, Central, Axillary
- Any skin changes or nipple discharge or retraction?
- Association with menstrual cycle?
- Association with pain?
- Any previous biopsies?

## Examination – Performance Status

- Once H&P examination are completed, patients may be evaluated by their **performance status.**
- Performance status assessment is standard practice while on clinical trials, the APP should include the assessment on routine documentation.
- Has both prognostic and therapeutic implications.
- Documentation allows clinicians to monitor for any subsequent changes either from disease and/or therapy.



## Examination – Performance Status

- The Karnofsky Performance Scale and the Eastern Cooperative Oncology Group (or ECOG) performance scale (also called Zubrod) are the two most commonly used scales in clinical practice and trials.
- The **Karnofsky Scale** has 11 levels of evaluation from death to perfect health, with a percentage score ranging from 0-100 assigned to each level.
- The ECOG performance scale has 6 levels (0-5); level 0 indicates fully ambulatory and functional and level 5 indicates death.
- Please study the table as several test questions are produced from this.



## Examination – ECOG PS

#### Table 5-2. Eastern Cooperative Oncology Group Performance Status Scale

Description	Grade
Fully active, able to perform all predisease performance without restriction	0
Restricted in physically strenuous activity but ambulatory and able to perform work of a light or sedentary nature (e.g., light housework, office work)	1
Ambulatory and capable of all self-care but unable to perform any work activities; up and about more than 50% of waking hours	2
Capable of only limited self-care; confined to bed or chair more than 50% of waking hours	3
Completely disabled; cannot perform any self-care; totally confined to bed or chair	4
Dead	5

Note. Based on information from Oken et al., 1982.



## Examination – Karnofsky PS

#### Table 5-1. Karnofsky Performance Status Scale

Karnofsky Criteria	Score (%)
Normal; no complaints; no evidence of disease	100
Able to perform normal activity; minor signs or symptoms of disease	90
Normal activity with effort; some signs and symptoms of disease	80
Cares for self; unable to perform normal activity or do active work	70
Requires occasional assistance but is able to care for most personal needs	60
Requires considerable assistance and frequent medical care	50
Disabled; requires special care and assistance	40
Severely disabled; hospital admission indicated although death not imminent	30
Very sick; hospital admission necessary; active supportive treatment necessary	20
Moribund; rapid progression of fatal processes	10
Dead	0

Note. Based on information from Karnofsky et al., 1948.

## Examination – Performance Status

ECOG Grade	ECOG	Karnofsky Criteria	%
0	Fully active, able to carry on all pre-disease performance without restriction	Normal; no complaints; no evidence of disease	100
1	Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature (ie light housework, office work)	Able to carry on normal activity; minor signs or symptoms of disease	90
		Normal activity with effort; some signs or symptoms of disease	80
2	Ambulatory and capable of all self-care but unable to carry out any work activities; up and about more than 50% of waking hours	Cares for self; unable to carry on normal activity or to do active work	70
	Ŭ	Requires occasional assistance but is able to care for most personal needs	60
3	Capable of only limited self-care; confirmed to bed or chair more than 50% of waking hours	Requires considerable assistance and frequent medical care	50
			40
4	Completely disabled; cannot carry on any self-care; totally confined to bed or chair	Severely disabled; hospital admission indicated although death not imminent	30
			20 10
5	Dead	Dead	0



## Test Question 1

- Patient with metastatic breast cancer reports that they are confined to the couch for most of the day, requiring bathing assistance. How would the Advanced Practice Provider (APP) rate the patient's performance status?
- ECOG 0
- ECOG 2
- ECOG 3
- ECOG 4



## Test Question 1 – ANSWER

# •ECOG 3



## Test Question 2

- What factor would limit patient entrance to clinical trial?
  - Performance Status
  - Insurance
  - Physician
  - None of the above



## Test Question 2 – ANSWER

# Performance Status



## Imaging

- Factors to consider:
  - Tumor characteristics
  - Sensitivity
  - Specificity
  - Radiation dose
  - Cost effectiveness





## Imaging

**Sensitivity** refers to the ability of the test to accurately identify a particular disease and is expressed as a percentage This is calculated by dividing the number of patients who test positive for the disease by the total number of tested patients who actually have the disease.

**Specificity** refers to the ability of the test to accurately identify the absence of a particular disease and also is expressed as a percentage. It is calculated by dividing the number of patients who test negative for the disease by the number of tested patients who do not have the disease.

The ideal diagnostic test would result in a positive result for affected individuals and a negative result for unaffected individuals.

A false positive means that a positive result occurred in an individual who does not have the disease, and a false negative means that a negative result occurred in an individual who does have the disease. Diagnostics tests that have the greatest clinical utility are test that have the *greatest* percentage of *true-positive and true-negative results* and the *lowest* percentage of false-positive and false-negative results.



## **Breast Imaging**

- Mammograms remain gold standard
- Only test that has shown to reduce morbidity and mortality
- Detects 86-91% of breast malignancies
- 30% decrease in breast cancer mortality





## **Breast Imaging**

### **Screening Mammogram**

- \*Asymptomatic
- Has 2 projections (cc view /cranial-caudal or top to bottom view) and MLO /medio-lateral oblique view

### **Diagnostic Mammogram**

- \*Symptomatic
- Has additional views (LM view or true lateral view)
- Spot compressions
- Magnification views



## **Diagnostic Mammogram**

Indications – Palpable breast mass

- Breast Composition density of breast
- Important Findings
  - Masses
    - mass is a space-occupying lesion seen in two different projections
    - If a potential mass is seen in only a single projection, it should be called an asymmetry or a density until its three-dimenionality is confirmed
  - Calcifications
    - are tiny cluster of small calcium deposits
  - Architectural distortion
    - a distortion in the structure of the breast tissue
  - Combination of above
- Comparison to Previous studies



## Mammogram Assessment Category

- The Breast Imaging Report and Data System (BIRADS) of the American College of Radiology (ACR) is today largely used in most countries where breast cancer screening is implemented.
- A tool defined to reduce variability between radiologists when creating the reports in mammography, ultrasonography or MRI.
- Mammographic assessment is incomplete
  - Category 0
- Mammographic assessment is complete
- Category 1
- Category 2
- Category 3

- Category 4
- Category 5
- Category 6





## **BI-RADS Mammographic Assessment Categories**

Assessment category	Recommendation	Probability of malignancy	
0: Incomplete	Need for further evaluation	Not applicable	
1: Normal	Normal interval follow-up	0 percent	
2: Benign	Normal interval follow-up	0 percent	
3: Probably benign	A short interval follow-up is recommended	<2 percent	
4: Suspicious abnormality	A biopsy should be	≥2 to <95 percent	
	considered	(a) Low-risk	
		(b) Intermediate-risk	
· ·		(c) Moderate to high-risk	
5: Highly suggestive of malignancy	Biopsy or surgery should be performed	≥95 percent	
6: Biopsy-proven carcinoma	Appropriate action should be taken	The standard state of the st	

BI-RADS: Breast Imaging Reporting and Data System.

## **Breast Ultrasound**

- Breast
- Visible
- Skin changes
- Consistency
- Size
- Mobility
- Location
  - O'clock position
  - Distance from the nipple
- ? Multifocal /multicentric tumors
- ? Ultrasonography occult

- Mammogram does not replace a clinical breast exam
- Ultrasound used as an adjunct test for highrisk patient with dense breast tissue or lesion found on mammogram
- Negative predictive value of u/s is more than 97%
- Both DI modalities complement each other
- Mammogram followed by u/s and in that order



## **Breast MRI: Clinical Applications**

- Ordering Breast MRI requires careful patient selection
- Advantages:
  - More sensitive than MMG
    - Meaning that it can detect both cancerous and benign lesions
  - Use gadolinium contrast
  - BRCA positive mutation carriers

#### • Disadvantages:

- Expensive leading to financial toxicity
- False (+), may lead to high anxiety
- Patient limitations- Claustrophobic/hernia
- Calcifications are not detectable by MRI (Low grade DCIS); Hence MRI does not replace a mammogram according to multiple studies





## Test Question 3

- A 50-year-old patient had an abnormal screening mammogram revealing a BIRADS Category 0. The APRN should know to order which modality next?
  - Diagnostic Mammogram
  - Breast MRI
  - PET scan
  - Biopsy



## Test Question 3 – ANSWER

• DIAGNOSTIC MAMMOGRAM



## Test Question 4

- 45 yo patient with breast cancer who tested positive with genetic mutation, the APRN can deduce that patient has:
  - DCIS
  - Bilateral breast cancer
  - Nulliparity
  - Tobacco user
  - None of the above



## Test Question 4 – ANSWER

• Bilateral breast cancer



## Test Question 5

- A breast MRI should be ordered on which type of patient:
  - Patient with DCIS
  - Nulliparity
  - BRCA positive
  - None of the above



## Test Question 5 – ANSWER

• BRCA positive patient



## **Diagnostic Procedures**

- Tissue sampling with biopsy is critical to obtain a diagnosis
  - Fine Needle Aspiration (FNA)
  - Core Needle biopsy
  - Incisional biopsy
  - Excisional biopsy



## Diagnostic Procedures – FNA

- Non-surgical procedure
- Ultrasound guided
- Uses thinner needle
- Removes cells from suspicious mass
- Draw back unable to differentiate if cancer is invasive vs non-invasive
- Lymph nodes
- Results: ? Lymphoid tissue in specimen; ? Nondiagnostic





## Diagnostic Procedures – Core Needle Biopsy

- Non-surgical
- Ultrasound guided
- Larger bore needle
- 16, 14, 11 gauge
- Able to differentiate carcinoma is invasive vs non-invasive
- Avoid open surgical procedure



### Diagnostic procedure – Incisional vs excisional biopsy

- Excisional biopsy
  - a surgical procedure in which all of the abnormal area is removed.
- Used for smaller lesions
- Incisional biopsy
- a surgical procedure which removes a small sample of a large lesion.
- Both methods are rarely used
- Not considered breast oncologic surgery
- Be a patient advocate
- ie. 6 cm mass and radiologist orders an MRI guided biopsy?



## **Biopsy Techniques**

Віорѕу Туре	Advantages	Disadvantages	Common Use
Fine Needle Aspiration (FNA)	Non-surgical Ultrasound guided Removes cells from suspicious mass, lymph nodes Uses thinner needle: 20-21-gauge needle Less invasive Inexpensive	Can be painful Unable to differentiate if cancer is invasive vs non-invasive Hematoma May require additional biopsy or core needle biopsy	Palpable lymph nodes Groin areas Breast masses
Core Needle Biopsy	Non-surgical Ultrasound guided Larger bore needle 16, 14, 11 gauge Able to differentiate carcinoma is invasive vs non-invasive Avoid open surgical procedure Less invasive & inexpensive	Can be painful May require additional biopsy Hematoma	Breast masses, architectural distortions or calcifications


# **Biopsy Techniques**

Віорѕу Туре	Advantages	Disadvantages	Common Use
Stereotactic Biopsy	Mammogram guidance Non-surgical procedure Uses 9-gauge vacuum assisted device Document amount of cores Marker clips deployed to biopsy cavity A post procedural mammogram	Can be painful Requires Prone position Hematoma Clip migration May require additional biopsy	Breast masses, architectural distortions or calcifications
Incisional Biopsy	a surgical procedure which removes a small sample of a large lesion. Outpatient procedure	Can be painful More invasive Risk of delayed wound healing Hematoma No clear margins May delay further treatment if complications Scar	Any mass
Excisional Biopsy	a surgical procedure in which all of the abnormal area is removed. Used for smaller lesions Outpatient procedure	Can be painful More invasive Risk of delayed wound healing Hematoma May delay further treatment if complications Scar	Any mass



# Biopsy Techniques – Pearls

- Excisional or Incisional biopsy are NOT considered breast oncologic surgery
- Biopsy technique is critical
- At times, detrimental to patient when electing one in error
- Be a patient advocate
- ie. 6 cm mass and radiologist orders an MRI guided biopsy?



### • Pathologic classification of invasive breast cancer

- Ductal (account 80%)
- Inflammatory (T4d)
- Lobular
- Medullary, Mucinous, Papillary, Metaplastic

### • Pathologic classification of non-invasive breast cancer

- Ductal carcinoma in situ
- Paget's



- Invasive breast carcinomas are graded using the Nottingham combined histologic grade
- Grading is distinct from staging and refers to the degree of differentiation of a tumor.
- The grade is determined by assessing 3 morphologic features:
  - Tubule formation
  - Nuclear polymorphism
  - Mitotic count



- The histologic grade can be:
  - GX can not be assessed
  - G1 low combined histologic grade with a score of 3-5 (favorable)
  - G2 intermediate combined histologic grade with a score of 6-7 (moderately favorable)
  - G3 high combined histologic grade with a score of 8-9 (unfavorable)
  - **\*\***Poorer differentiation indicates a poorer prognosis



- Ki-67 is a protein and a common marker used to measure how quickly cancer cells are dividing and to help predict how a cancer will respond to treatment
- Higher Ki-67 score means that more cells are dividing quickly, which indicates a higher risk of the cancer growing and spreading
- Score over 30% is generally considered high



## **Molecular Receptors**

- Estrogen Receptor (ER)
  - (ER+) breast cancer is a breast cancer subtype that describes cancer cells that have estrogen receptors, or proteins, that bind to the hormone estrogen.
  - ER + is favorable prognostic marker
- Progesterone Receptor (PR)
  - (PR+) breast cancer means that some of the cancer cells have progesterone receptors. Progesterone is a hormone that attaches to these receptors and helps the cancer cells grow
- HER 2 status
  - or human epidermal growth factor receptor 2, is a protein that's involved in normal cell growth



# Oncotype DX

- The Oncotype DX is a tumor profiling test that analyzes 12 genes in a tumor sample to help determine a patient's risk of cancer recurrence and treatment options.
- Used for breast and colon cancer
- The Oncotype DX Breast Cancer Test groups scores into three categories:
  - Low risk: Scores under 10
  - Intermediate risk: Scores between 11 and 25
  - High risk: Scores 26 and above
- Can help determine whether chemotherapy is beneficial for a patient, as the benefits may not outweigh the risks



## Test Question 6

- Which pathology marker has a poor prognostic factor?
  - Ki-67 of 70%
  - HER 2 non-amplified
  - ER positive
  - Onctoype DX score of 12



## Test Question 6 – ANSWER

• Ki-67 of 70%



# Anatomic Staging

- Staging is the process of determining the location and extent of the primary cancer
- Tumor, Node, Metastasis (TNM) staging system used for most solid cancers. Created in 1959
- The American Joint Committee on Cancer (AJCC) maintains the staging system in US
- The AJCC Cancer Staging Manual is the gold standard to help the cancer patient management team determine the correct stage, allowing for the most appropriate care plan; in a uniform way so that the treatment results of all people can be compared and understood



# TNM

### • T= Tumor

- TX Tumor cannot be assessed
- T1 Tumor is 2 cm or less
- T2 Tumor is between 2.1 cm 5.0 cm
- T3 Tumor is more than 5.0 cm
- T4 Tumor of any size AND has invaded nearby structures as the chest wall and skin of the breast
  - T4a Extension to the chest wall
  - T4b Edema (including peau d'orange), or ulceration of the skin of the breast, or satellite skin nodules confirmed to the same breast
  - T4c Both 4a and 4b, above
  - T4d Tumor is inflammatory breast cancer



# TNM

### • N= Node

- NX = Cannot be assessed
- N0 = means no cancer is in the regional lymph nodes.
- N1-3 = means regional lymph node metastasis found

### • M= Metastasis

- M0 no evidence of distant metastasis
- M1 means distant metastasis found



## **Prognostic Staging**

- Includes anatomic TNM
- Tumor Grade
- Biomarkers (ER, PR, HER2)
- Tumor multigene panel testing (ie Oncotype DX Score)

\*\*The prognostic stage group is preferred for patient care and is to be used for reporting of all cancer patients in the US. The assumption that patient is receiving **standard of care** 



## Breast Cancer Staging – 8<sup>th</sup> Edition of the AJCC

### • Clinical Prognostic Stage –

			ER+, PR+, HER2+	ER+, PR+, HER2-	ER+/PR-, HER2+	ER-/PR+, HER2+	ER-, PR-, HER2+	ER+, PR-, HER2-	ER-, PR+, HER2-	ER-, PR-, HER2-	Anatomic stage
TisN0	M0	G1-3	0	0	0	0	0	0	0	0	0
TINO		G1	IA	IA	IA	IA	IA	IA	IA	IB	IA
TON1mi		G2	IA	IA	IA	IA	IA	IA	IA	IB	IA
TINImi		G3	IA	IA	IA	IA	IA	IA	IB	IB	IA
TONI		G1	IB	IB	IIA	IIA	IIA	IIA	IIA	IIA	IIA
TINI		G2	IB	IB	IIA	IIA	IIA	IIA	IIA	IIB	IIA
T2N0		G3	IB	IIA	IIA	IIA	IIA	IIB	IIB	IIB	IIA
T2N1 T3N0		G1	IB	IIA	IIA	IIA	IIB	IIB	IIB	IIB	IIB
		G2	IB	IIA	IIA	IIA	IIB	IIB	IIB	IIIB	IIB
		G3	IB	IIB	IIB	IIB	IIB	IIIA	IIIA	IIIB	IIB
T0N2 T1N2 T2N2 T3N1		G1	IIA	IIA	IIIA	IIIA	IIIA	IIIA	IIIA	IIIB	IIIA
		G2	IIA	IIA	IIIA	IIIA	IIIA	IIIA	IIIA	IIIB	IIIA

## Breast Cancer Staging – 8<sup>th</sup> Edition of the AJCC

• Pathologic Prognostic Stage – patients who undergo upfront surgery

		_	ER+, PR+, HER2+	ER+, PR+, HER2-	ER+/PR-, HER2+	ER-/PR+, HER2+	ER-, PR-, HER2+	ER+, PR-, HER2-	ER-, PR+, HER2-	ER-, PR-, HER2-	Anatomic stage
TisN0	M0	G1-3	0	0	0	0	0	0	0	0	0
T1N0 T0N1mi T1N1mi		Gl	IA	IA	IA	IA	IA	IA	IA	IA	IA
		G2	IA	IA	IA	IA	IA	IA	IA	IB	IA
		G3	IA	IA	IA	IA	IA	IA	IA	IB	IA
TONI		G1	IA	IA	IB	IB	IIA	IB	IB	IIA	IIA
TINI		G2	IA	IA	IB	IB	IIA	IIA	IIA	IIA	IIA
T2N0		G3	IA	IB	IIA	IIA	IIA	IIA	IIA	IIA	IIA
		GI	IA	IA	IIB	IIB	IIB	IIB	IIB	IIB	IIB
T2N1 T3N0		G2	IB	IB	IIB	IIB	IIB	IIB	IIB	IIB	IIB
		G3	IB	IIA	IIB	IIB	IIB	IIB	IIB	IIIA	IIB
T0N2 T1N2 T2N2 T3N1 T3N2		G1	IB	IB	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA
		G2	IB	IB	IIIA	IIIA	IIIA	IIIA	IIIA	IIIB	IIIA
		G3	IIA	IIB	IIIA	IIIA	IIIA	IIIA	IIIA	IIIC	IIIA
T4N0 T4N1 T4N2 AnyN3		G1	IIIA	IIIA	IIIB	IIIB	IIIB	IIIB	IIIB	ШВ	IIIB
		G2	IIIA	IIIA	IIIB	IIIB	IIIB	IIIB	IIIB	IIIC	IIIB
		G3	IIIB	ШВ	IIIB	IIIB	IIIB	IIIC	ШС	IIIC	IIIB
Any	MI	Any	IV	IV	IV	IV	IV	IV	IV	IV	IV

# Staging

- For stage I-IIB disease, no additional imaging is recommended in an asymptomatic patient.
- Additional imaging tests should be directed by signs and symptoms, keeping in mind that the most common sites of distant metastasis in breast cancer are the bone, lung, liver, and brain.
- So we should order a bone scan if there are reports of localized bone pain or elevated alkaline phosphatase or abnormal LFTs, or abnormal abdominal examination.
- For patients with Stage III disease, then CT is indicated



## Test Question 7

- A 30-year-old female patient was recently diagnosed with inflammatory breast cancer after having a breast biopsy for confirmation. However, ultrasound was unable to assess nodal involvement. Since she complained of significant back pain, a CT and bone scan were ordered which demonstrated osseous metastasis. What would be her staging designation?
  - T4dN1M1
  - T4dNXMX
  - T4dNXM1
  - TXNXM1



## Test Question 7 – ANSWER

# •T4dNXM1



# Surgery

- Goal of surgery is removal of breast tumor, with aim of obtaining negative margins, and obtain pathologic staging
- Curative intent for early or localized disease
- APN role in surgery preoperative evaluation, risks of surgery, post-operative education and management, necessary referrals.



## Surgical Procedures - Breast Conservation Surgery

#### • Considerations:

- Unifocal
- Selected multifocal disease
- Breast / Tumor ratio
- Nearby anatomy (NAC, pectoralis, skin)
- Incision dependent on needle/palpation
- Pathology: 2mm margins
- Incision: single, dependent on localization
- **Recovery:** <2 weeks, adjuvant radiation standard





## Surgical Procedures - Breast Conservation Surgery

### Advantages

- Smaller operation
- Conserve Body Image
- Faster recovery
- In absence of genetic mutation, survival is similar to a mastectomy

### Disadvantages

- Radiation
- Intra-operative ultrasound for localization
- Needle wire localization vs Seed localization
- Risks of surgery: requiring re-excision if unable to obtain negative margins, seroma



## Surgical Procedures – Total Mastectomy

• Total Mastectomy



• Skin-sparing Mastectomy



Nipple sparing Mastectomy

- Diagnosis: cancer, BRCA mutation, family history
- Considerations
  - Multifocal
  - Multicentric
  - Poor Breast / Tumor ratio
  - BRCA1/2
  - Contraindication to XRT
  - Patient health and co-morbidities



## Lumpectomy vs Mastectomy

- Both have relatively similar survival rates
- Surgical approach does not affect decision of systemic therapy
- May affect adjuvant radiation 100% needed after lumpectomy. Postmastectomy radiation therapy will depend on final pathology especially in setting of advanced disease



### Clinical Trials Comparing Mastectomy vs Lumpectomy + XRT

Overall Survival (for length of follow up)

Study	Study Population	Stage of Breast Cancer	Follow up (years)	Mastectomy	Lumpectomy + XRT
NSABP B-06	1,851	Stage 1-II	21	47%	46%
EORTC	868	Stage 1-II	22	45%	39%
Danish Breast Cancer Cooperative Group [3]	731	Stage 1-III	20	58%	51%
Veronesi et al.	701	Stage I	26	44%	38%
National Cancer Institute	237	Stage I-II	26	44%	38%
Arriagada et al.	179	Stage I	22	52%	60%

https://ww5.komen.org/BreastCancer/Table37Mastectomyversuslumpectomyplusradiationandoverallsurvivalinearlybreastcancer.html

## Test Question 8

- 45 yo patient had a lumpectomy 14 days ago and now presents to clinic with a ballotable mass. APRN should prepare for
  - Needle aspiration
  - Re-excision
  - Breast MRI
  - PETCT



## Test Question 8 - ANSWER

• Needle aspiration of seroma



# Nodal Staging for Breast Cancer

• SLN surgery recommended for early stage clinically node negative breast cancer





# Axillary lymph node dissection

- Removal of all the lymph nodes in the axillary level I and II
- Level 1 is the bottom level, below the lower edge of the pectoralis minor muscle.
- Level II is lying underneath the pectoralis minor muscle
- Level III is above the pectoralis minor muscle





# Lymphedema

- Risk of Lymphedema
- The lymph system is a network of lymph vessels, tissues, and organs that carry lymph throughout the body.
- Lymphedema occurs when lymph is not able to flow through the body the way that it should.
- Lymphedema is the build-up of fluid in soft body tissues when the lymph system is damaged or blocked.





# Lymphedema – Risks & Management

### Causes include:

- Breast cancer surgery
- When axillary lymph nodes are removed
- Radiation therapy
- Chemotherapy causes fibrosis to lymphatic vessels
- Trauma

### Management

- Early-stage lymphedema treated with nonsurgical interventions- medication, a healthy diet and manual compression.
- For advanced-stage lymphedema, surgical intervention may be recommended.



## Test Question 9

- 42 yo patient had a lumpectomy of a 3 cm mass. Final pathology revealed an infiltrative ductal carcinoma with positive margins, ER positive, HER 2 negative. The APRN instructs the patient that:
  - This is a non-invasive breast cancer which requires re-excision
  - This is an invasive breast cancer which requires re-excision
  - Patient will require chemotherapy treatment
  - None of the above



## Test Question 9 - ANSWER

• This is an invasive breast cancer which requires re-excision



# Systemic Therapy - Outline

- Commonly used chemotherapy for treatment of breast cancer
  - Ex. Doxorubicin/cyclophosphamide (AC) etc
  - Clinical implications
- Hormone Therapy
  - Tamoxifen, aromatase inhibitors
  - $\circ~$  Clinical implications
- Biologic-Targeted Therapies
  - Trastuzumab, Pertuzumab, Ado-trastuzumab
  - Clinical implications (cardiac monitoring when to hold/delay treatment)
- Targeted Therapy
  - $\circ$  Palbociclib etc
  - Clinical implications



### **Chemotherapy Treatment - Taxanes**



- Antimitotic Agents
  - Active during the mitosis phase (M phase)
  - Plant-derived vinca alkaloids
  - Taxanes
  - Eribulin mesylate

- Paclitaxel (Taxol)
  - Derived from Pacific Yew tree
  - Protein bound, metabolized in liver, & excreted in the bile
  - Requires pre-medication with Dexamethasone, Benadryl, and Histamine-2 antagonist
  - Can be given Intraperioneal
  - Contraindicated in Pregnancy
  - Considered a radiosensitizer
  - **Potential toxicities**: Peripheral Neuropathy, bone marrow suppression, hypersensitivity reactions, alopecia, myalgia, Cardiac



## Chemotherapy – Abraxane

- Paclitaxel protein-bound particle for injectable suspension albumin-bound (Abraxane)
  - Protein bound, metabolized in liver
  - Does not require pre-medication
  - Potential toxicities: Use cautiously with hepatic dysfunction, hypersensitivity reaction, neuropathy, fatigue, bone marrow suppression, alopecia, nausea




# Chemotherapy – Doxorubicin



- Cell Cycle Specific antitumor Antibiotics
  - Doxorubicin
  - Myelosuppression with nadir in 10-14 days
  - Recovery by day 21
  - Drug excreted in urine & Bile
  - Pregnancy protocol regimen after 2 nd trimester
  - Risk of cardiotoxicity
  - Administration
    - Limit lifetime cumulative dose to <550 mg/m<sup>2</sup> to reduce risk of cardiotoxicity
    - Monitor: CBC, cardiac function, LFTs, MUGA or ECHO
  - Other potential toxicities: Bone marrow suppression, alopecia, radiation recall, urine pink discoloration, nausea, vomiting, gonadal suppression
  - Antidote: Dexrazoxane



# Chemotherapy – Platinum Drugs

- Alkylating Agents
  - Platinum analogs (ie Cisplatin, Carboplatin, Oxaliplatin)
  - Cyclophosphamide (Cytoxan)
  - AC combination
  - Pregnancy protocol regimen after 2 nd trimester
  - Administration Q 21 days vs dose dense
  - **Potential Toxicities**: \*Hemorrhagic cystitis, myelosuppression, neuropathy, secondary malignancies, Gonadal suppression, alopecia, fatigue, nausea and vomiting





# Hormone Therapy – Tamoxifen

- An oral nonsteroidal, selective Estrogen receptor modulator
- An estrogen antagonist in breast tissue but agonist in other tissues (ie Endometrium, bone)
- Indications:
  - 1. adjuvant treatment of adults with early-stage estrogen receptor-positive breast cancer
  - 2. Reduce occurrence of contralateral breast cancer
  - 3. ER + metastatic breast cancer
  - 4. Pre-menopausal women
- Dose 20 mg PO daily
- Metabolized by the CYP2D6 microenzyme system
- \*Paroxetine & fluoxetine inhibit the CYP2D6 enzyme pathway
- **Toxicity Profile:** hot flashes, irregular menses, endometrial changes, risk of thromboembolic events, prolonged QTc interval, rare thrombocytopenia, \*Ocular toxicities such as corneal deposits and retinopathy





## Hormone Therapy – Letrozole

- An antiestrogen
- Indications:
  - Postmenopausal women with hormone receptor positive early breast cancer
  - Extended adjuvant treatment who have received 5 yr of adjuvant tamoxifen
  - First and second-line treatment of advanced breast cancer
- Dose 2.5 mg PO Daily
- Post-menopausal women only
- **Toxicity profile:** hot flashes, increased for osteoporosis, arthralgias, fatigue, peripheral edema, nausea, dizziness.





## Hormone Therapy – Aromasin



- An antiestrogen
- Indications: Adjuvant treatment for early, ER + breast cancer
- Post-menopausal women only
- Dose 25 mg PO Daily
- **Toxicity profile:** hot flashes, increased for osteoporosis, arthralgias, Diaphoresis, fatigue, peripheral edema, nausea, dizziness.



# Biologic-Targeted Therapies - Trastuzumab

- A monoclonal antibody that targets human epidermal growth factor receptor-2(HER2).
- Indicated for treatment of HER2 positive patients with breast cancer
- In combination with AC chemo and either paclitaxel or docetaxel
- Contraindicated in Pregnancy
- \*Assess LVEF prior to initiation and frequently during treatment
- Monitor: cardiac function, MUGA or ECHO
- Profile Toxicity: Cardiomyopathy, hypersensitivity reaction, ARDS, headache, diarrhea, nausea



# Biologic-Targeted Therapies -Pertuzumab

Monoclonal antibody



- Used in combination with trastuzumab and docetaxel for metastatic HER2positive breast cancer
- Also used in neoadjuvant setting for early HER2-positive breast cancer.
- Monitor LVEF ~q12Weeks
- LVEF of ≥50% is required after completion of anthracyclines, before starting pertuzumab
- Monitor: cardiac function with ECG, electrolytes, **MUGA or ECHO**
- Profile Toxicity: Cardiomyopathy, hypersensitivity reaction, ARDS, headache, diarrhea, nausea



- The APRN knows to anticipate radiation therapy after a patient having a total mastectomy for which patient?
  - 12 cm of DCIS with negative margins
  - HER 2 positive breast cancer
  - ER positive breast cancer
  - Patient with 5 positive axillary lymph nodes out of 16.



#### Test Question 10 - ANSWER

• Patient with 5 positive axillary lymph nodes out of 16.



- A patient is 24 weeks pregnant with HER2 positive, ER negative Stage III breast cancer. The APRN should inform the patient that:
  - Safe to give chemotherapy after 2 nd trimester with low risk of malformation
  - Not safe to perform a total mastectomy
  - Radiation is safe during pregnancy
  - Targeted therapies are safe during pregnancy



#### Test Question 11 - ANSWER

 Safe to give chemotherapy after 2 nd trimester with low risk of malformation



- 52 yo patient with a 7 cm breast mass with associated breast edema is seen in clinic. The APRN should anticipate that the patient will start with:
  - Surgery
  - Radiation
  - Neoadjuvant chemotherapy
  - Brachytherapy



#### Test Question 12 – ANSWER

Neoadjuvant chemotherapy



- 70 yo female with CHF, HTN, and diabetes has a newly diagnosed left invasive ductal carcinoma, moderately differentiated, ER positive, PR positive, HER 2 negative, clinical T2N1M0. After reviewing her history, the APRN would anticipate treatment with:
  - Tamoxifen
  - Anthracycline based chemotherapy
  - Herceptin
  - Pertuzumab



• Tamoxifen



#### Radiation

- Radiation performed after breast conservation surgery
- Radiation given to selected cases after Total Mastectomy
  - Multiple lymph nodes
  - Large tumor size
  - Positive margins
- Goal is to reduce risk of local recurrence
- Radiation to entire breast



## Radiation

#### • Absolute Contraindications

- Prior Chest RT
- RT during Pregnancy
- Diffuse calcifications
- Widespread disease
- Positive Pathological Margins

#### • Relative Contraindications

- Active Connective Tissue Disorders
- Focal Positive margin





## Radiation

#### **Short Term Side Effects**

- Hair Loss
- Fatigue
- Skin breakdown
- Swelling

#### Long Term Side Effects

- Hypo or Hyper pigmentation
- Cardiac complications (left sided breast cancer)
- Lymphedema
- Breast changes
- Rib fracture
- Pulmonary

### Test Question 14 – LAST

- Which type of patient who is receiving radiation is at risk for cardiac complications?
  - Right sided breast cancer
  - Appendiceal cancer
  - Head and neck cancer
  - Left sided breast cancer



#### Test Question 14 – ANSWER

• Left sided breast cancer





#### Thank you!

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#### REVIEW COURSE 2024

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Making Cancer History\*