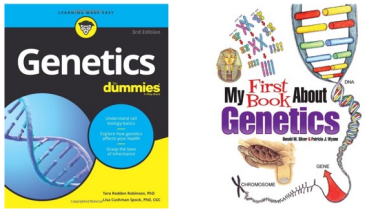
Breast Cancer 101

Louise C Miller, RTRM, FSBI, FNCBC
Director of Education
Mammography Educators – San Diego, CA

1

My Experience with Genetics

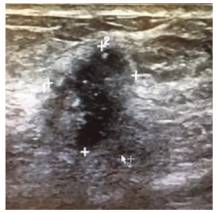


2

Sally

3

Sally



4

Joan

5

Alexa

6

Alexa

7

Presenter Introduction

Stephanie Percich, MS, CGC

Certified Genetic Counselor
Denver, CO

The Technologist's Role in Breast Cancer Risk Assessment

Communicating the benefits of comprehensive risk assessment to patients

Section 1: Breast Cancer 101: Everything You Need to Know

8

Breast Cancer 101: Program Overview and Disclaimer

Overall course description:
In this 1-unit module, attendees will deepen their foundational breast cancer knowledge, learn how breast cancer affects different populations, and gain an understanding of a variety of risk factors for the development of breast cancer.

Disclaimer
This information is provided to help answer questions with respect to hereditary cancer risk assessment and hereditary cancer testing. It is general in nature and is not intended to provide a comprehensive, definitive analysis of specific risks. The information provided herein should be taken into consideration with other medical and research information regarding cancer risks, hereditary cancer risks and pre-dispositional cancer testing and risk factors.

Personal and Non-Commercial Use
These slides are for your personal education and non-commercial use. You may not modify, publish, reproduce, license, create derivative works from or sell any information obtained from these slides.

9

Breast Cancer 101: Learning Objectives

01 Understand basic breast anatomy, breast cancer statistics and racial/ethnic and gender specific factors

02 Describe the common types of breast cancer and components of a breast cancer diagnosis

03 Discuss risk factors for breast cancer, including key breast imaging factors

04 Learn how to appropriately discuss breast cancer basics with patients in collaboration with your facility and leadership team(s)

10

Background statistics

- Breast cancer is the most common cancer diagnosed in women in the US (except for skin cancer)
- 1 in 8 (~13%) women in the US will be diagnosed with breast cancer in her lifetime
- The American Cancer Society estimates that in 2022 in the US:
  - 287,850 women will be diagnosed with invasive breast cancer
  - 51,400 women will be diagnosed with ductal carcinoma in situ (DCIS)
  - 43,250 women will die from breast cancer
- Breast cancer is the 2nd leading cause of cancer death in women (second to lung cancer)

1 in 8
women in the US will be diagnosed with breast cancer

Reference: www.cancer.org

11

Race/ethnicity

- Black women have the highest death rate from breast cancer
  - 1 in 5 (20%) Black women with breast cancer have triple negative breast cancer
- Black women are more likely than white women to be diagnosed with breast cancer before age 40
- Black women are more likely to die from breast cancer
- White and Asian/Pacific Islander women are more likely to have a localized breast cancer than Black, Hispanic, American Indian/Alaska Native women
- Asian/Pacific Islanders have the lowest death rate

1 in 5
Black women have triple negative breast cancer

Reference: www.cancer.org

12

Male breast cancer statistics

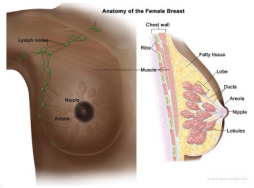
- The American Cancer Society estimates that in 2022 in the US:
  - 2,710 men will be diagnosed with invasive breast cancer
  - 530 men will die from breast cancer
- Lifetime risk for male breast cancer: 1 in 833
- Prognosis is worse in Black men

Reference: www.cancer.org

13

Anatomy of the breast

- Lobules: tissue in the lobes that contain the glands that produce milk
- Ducts: tubes that carry milk from the lobules to the nipple
- Nipple: opening in the breast
- Areola: darker area of skin surrounding the nipple
- Lymph nodes: part of the immune system



Reference: www.cancer.org
Image from: www.foreverwell.com

14

Signs and symptoms of breast cancer

- Lump in the breast
- Breast swelling
- Pain
- Inverted nipple
- Dimpling of the skin
- Changes to the skin of the breast/nipple
- Nipple discharge
- Swollen lymph nodes under the arm

Twelve signs of breast cancer to learn about:
knowyourlemons.org

Reference: www.cancer.org
Image from: www.foreverwell.com

15

Types of breast cancer

- Carcinoma: cancer that starts in the epithelial cells
- Ductal: starts in the ducts
- Lobular: starts in the lobules

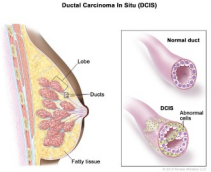
Key definitions: **Epithelial cells** - The cells that line the internal and external surfaces of the body (source: NCI)

Reference: www.cancer.org

16

Ductal Carcinoma in Situ (DCIS)

- ~20% of all breast cancers
- Stage 0 breast cancer
- Non-invasive



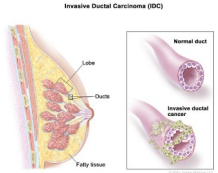
Key definitions: **Ductal Carcinoma in Situ** is a non-invasive form of cancer in which abnormal (cancer) cells are found in the lining of the breast duct and have not spread outside the duct to other breast tissues (source: NCI)

Reference: www.cancer.org
Image from: www.foreverwell.com

17

Invasive Ductal Carcinoma (IDC)

- Most common type of breast cancer
- ~80% of breast cancers are IDC
- Cancer starts in the cells lining the duct and grow through the wall of the duct into nearby tissue
- Can spread, metastasize (metastasis)



Key definitions: **Metastasize** - the spread of cancer from the primary site (place where it started) to other places in the body (source: NCI)

Reference: www.cancer.org
Image from: www.foreverwell.com

18

Inflammatory Breast Cancer (IBC)

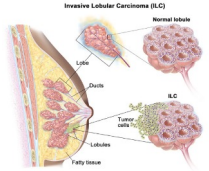
- Type of IDC
- 1-5% of all breast cancers
- Breast inflammation, swelling, redness
- Often doesn't form a lump, so it's harder to detect on mammogram
- More common in younger women and Black women
- More aggressive

Reference: www.cancer.org
Image from: www.breastcancer.org

19

Invasive Lobular Carcinoma (ILC)

- ~10% of all breast cancers
- Cancer starts in the lobules (glands that make milk)
- More difficult to detect on mammogram than IDC



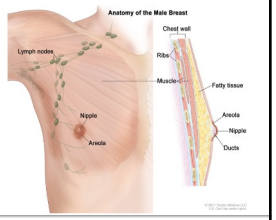
Reference: www.cancer.org
Image from: www.breastcancer.org

Key definitions: **Invasive lobular carcinoma (ILC)** is a type of invasive breast cancer that begins in the lobules (milk glands) of the breast

20

Male breast cancer

- Male breast tissue has ducts, but no (or only a few) lobules
- The ducts/lobules in the male breast typically aren't functional
- Most male breast cancers are Invasive Ductal Carcinoma
  - ~10% are Ductal Carcinoma in Situ (DCIS)
  - ~2% are Invasive Lobular Carcinoma (ILC)
  - Inflammatory breast cancer is very rare in men



Reference: www.cancer.org
Image from: www.breastcancer.org

21

Hormone receptors

- Receptors: proteins on the cancer cells that attach to estrogen and progesterone. Cancers are called hormone receptor-positive or hormone receptor-negative based on whether or not they have these receptors (proteins).
  - ER positive (ER+) vs. ER negative (ER-) breast cancers
  - PR positive (PR+) vs. PR negative (PR-) breast cancers
- Hormone receptor (HR) status helps the oncologist treat the cancer
- HR+ cancers often grow more slowly than HR-
- Most breast cancers are ER/PR positive

Most breast cancers are **ER/PR positive**

Reference: www.cancer.org

Key definitions: **ER** - estrogen receptor / **PR** - progesterone receptor status states whether breast cancer has ER and/or PR receptors

22

HER2

- HER2 is a protein that helps breast cancer grow quickly
- Tested for at the same time as ER/PR status
- HER2 negative: 0 or 1+
- HER2 positive: 3+
  - ~15-20% of breast cancers have high levels of HER2 (HER2+)
  - HER2+ cancers respond to a drug that targets HER2
- HER2 equivocal: 2+, needs additional testing

~15-20% Of breast cancers have high levels of HER2 (HER2+)

Reference: www.cancer.org

Key definitions: **HER2** is a protein called human epidermal growth factor receptor 2

23

Triple Negative Breast Cancer (TNBC)

- ER-, PR-, HER2-
- 10-15% of all breast cancers
- More common in younger women
- More common in Black women
- More common with certain gene mutations (e.g. BRCA1)
- More aggressive, more likely to metastasize, and more likely to recur
- Fewer treatment options than breast cancers positive for ER, PR, and/or HER2

TNBC **10-15%** Of all breast cancers

Reference: www.cancer.org

24

Breast cancer staging

- **T:** size and extent of the main tumor
  - TX-T4
  - Higher number means a bigger tumor and/or spread to nearby tissue
- **N:** number of lymph nodes involved
  - NX-N3
  - Higher number means the cancer was found in more lymph nodes
- **M:** whether the cancer has metastasized to distant organs
  - MX, M0, M1

Examples

T2N0M0:
- Tumor is 2-5cm,
- Has not spread to lymph nodes
- Has not spread to distant organs

T3N2M1:
- Tumor is >5 cm,
- Has spread to 4-9 lymph nodes
- Has spread to distant organs

Reference: www.cancer.org

25

5-year survival rates for breast cancer

SEER stage	5-year relative survival rate
Localized*	99%
Regional	86%
Distant	29%
All SEER stages combined	90%

*Localized stage only includes invasive cancer. It does not include ductal carcinoma in situ (DCIS).
Based on women diagnosed with breast cancer between 2011 and 2017.

Reference: www.cancer.org

Key definitions: **SEER** - Surveillance, Epidemiology, and End Results; database maintained by the National Cancer Institute to provide statistics on survival.

26

5-year survival rates for TNBC

SEER stage	5-year relative survival rate
Localized	91%
Regional	65%
Distant	12%
All stages combined	77%

Based on women diagnosed with triple negative breast cancer between 2011 and 2017.

Reference: www.cancer.org

27

5-year survival rates for Inflammatory Breast Cancer

SEER stage	5-year relative survival rate
Regional	54%
Distant	19%
All SEER stages	40%

There is no localized SEER stage for IBC since it has already reached the skin when first diagnosed.
Based on women diagnosed with inflammatory breast cancer between 2011 and 2017.

Reference: www.cancer.org

28

5-year survival rates for breast cancer in men

SEER stage	5-year relative survival rate
Localized	95%
Regional	83%
Distant	19%
All SEER stages combined	82%

Based on men diagnosed with breast cancer between 2011 and 2017.

Reference: www.cancer.org

29

Risk factors

Non-modifiable
- Female sex assigned at birth
- Age
- Certain inherited gene mutations (e.g. BRCA1/2)
- Family history of breast cancer
- Personal history of breast cancer
- Race/ethnicity
- Early menarche
- Late menopause
- Dense breast tissue
- Personal history of certain benign breast conditions

Reference: www.cancer.org

30

Risk factors

Modifiable

- Not having children (nulliparity)
- First childbirth after age 30
- Alcohol use
- Overweight/obesity
- Physical inactivity
- Hormonal therapy for menopause

Reference: www.cancer.org

31

Risk factors

Radiation exposure

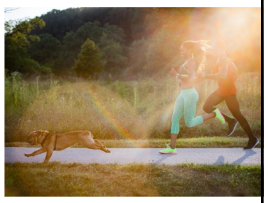
- Prior chest radiation for cancer treatment, specifically between age 10-30 years
  - Risk depends on the dose of radiation and age at which it was given
  - One study found that women receiving thoracic radiation for Hodgkin's lymphoma at age 25 had a 29% chance of getting breast cancer by age 55
  - These women should start screening with mammograms/breast MRIs at a younger age
- Radiation from a mammogram
  - Benefits outweigh the risks
  - On average, a mammogram with 2 views of each breast exposes the woman to 0.4 mSv of radiation
  - Our natural surroundings expose us to 3 mSv of radiation each year

References: cancer.gov, cancer.org, ncnm.org; J Natl Cancer Inst 2005;97:1428-37

32

Protective factors

- Breastfeeding
- Physical activity
- Healthy body weight
- Certain medications (e.g. tamoxifen, aromatase inhibitors, etc.)



Reference: www.cancer.org

Key definitions: Tamoxifen / Aromatase Inhibitors are examples of medications that can be taken to help lower the risk of getting breast cancer

33

Imaging findings

BI-RADS: Breast Imaging Reporting and Data System

- Provides standardization of breast imaging terminology and classification of findings for mammography, breast ultrasound, and breast MRI
- Allows clear and consistent communication of results and management recommendations
  - 0: incomplete- additional imaging is needed and/or comparison to prior mammograms necessary
  - 1: negative
  - 2: benign finding, 0% chance of malignancy
  - 3: probably benign, <2% chance of malignancy, follow-up in a short time frame is recommended
  - 4: suspicious abnormality, consider biopsy
    - 4A: low suspicion for malignancy, 2-9%
    - 4B: moderate suspicion for malignancy, 10-49%
    - 4C: high suspicion for malignancy, 50-94%
  - 5: highly suggestive of malignancy, >95% chance of malignancy, biopsy strongly recommended
  - 6: known biopsy-proven malignancy

References: www.cancer.org, www.radiologyinfo.org

34

Lobular Carcinoma In Situ (LCIS)

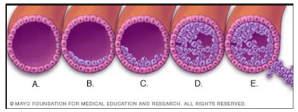
- Doesn't turn into breast cancer
- Abnormal cells don't grow outside of the lobules
- 7-12 times increased risk for breast cancer in either breast

Reference: www.cancer.org
Image from: www.breastcancer.org

35

Atypical Hyperplasia

- Atypical lobular hyperplasia (ALH)
- Atypical ductal hyperplasia (ADH)
- Abnormal (but non-cancerous) growth of cells in the ducts or lobules
- Treated with surgery
- 4-5x higher risk of breast cancer



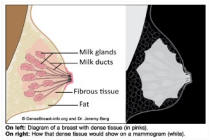
Reference: www.cancer.org
Image from: www.mayoclinic.org

36

Breast density

BI-RADS categories

- A: almost entirely fatty breast tissue, found in ~10% of women
- B: scattered areas of dense glandular tissue and fibrous connective tissue (Coopers Ligaments), found in ~40% of women
- C: heterogeneously dense breast tissue with many areas of glandular tissue and fibrous connective tissue, found in ~40% of women
- D: extremely dense breast tissue, found in ~10% of women



On left: Diagram of a breast with dense tissue (in pink).
On right: How that dense tissue would show on a mammogram (white).

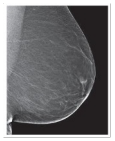
Reference: www.cancer.gov
Image from: www.thedensebreast-info.org

Key definitions: **Cooper's ligaments** are bands of connective tissue that help maintain the structural integrity of the breast. Heterogeneously dense breast tissue is a term used to describe breast tissue that has large areas of dense fibrous tissue and glandular tissue and also has some fatty tissue (NO)

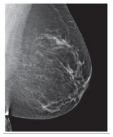
37

Breast density: BI-RADS categories

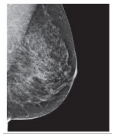
A: breasts are almost all fatty tissue



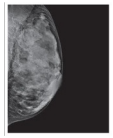
B: scattered fibroglandular tissue



C: heterogeneously dense



D: extremely dense



Reference: www.cancer.gov
Images from: www.acr.org

Key definitions: **Fibroglandular** is a term used to describe breast tissue that is made up of mostly fatty tissue and also has some dense fibrous tissue and glandular tissue (NO)

38

Breast density and cancer

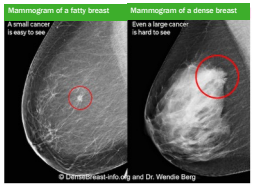


Image from: www.denesebreast-info.org

39

Notifying patients of breast density

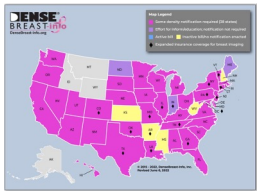


Image from: www.denesebreast-info.org

40

Key takeaway points

41

Key takeaway points

- Breast cancer is one of the most common cancers diagnosed in women in the US
- Racial disparities exist and Black women are more likely to die from breast cancer than women of other races
- There are several different types of breast cancer, but the most common is invasive ductal carcinoma (IDC)
- Staging systems allow for a standardized way of explaining the size of the tumor and whether it has spread
- Survival rates provide the chance of being alive within a certain time period, based on a specific diagnosis
- There are numerous risk factors for breast cancer, many cannot be changed, but there are some that are modifiable
- BI-RADS provides a standardized way of reporting what was seen on a breast imaging exam

42

Apply what you've learned, put into practice, and tips for implementation

Within the guidelines of your clinical practice in collaboration with your multi-disciplinary team

1. Discuss risk factors with patients
2. Provide information on breast density to patients (if appropriate): Densebreasts-info.org
3. Develop a script and/or handout to explain signs and symptoms of breast cancer:

Example verbiage:

"We will look forward to seeing you next year for your annual mammogram.

Please notify your healthcare provider and come in sooner if you notice any changes in your breasts. These changes may include a breast lump, firmness or thickening; nipple discharge; changes to your nipples; skin changes; breast swelling; breast pain; or anything else that seems out of the norm for you.

Most breast changes are not cancer, but if you notice anything, please schedule an appointment with your doctor right away."

43

References

- American Cancer Society. Breast cancer. Available: https://www.cancer.org/cancer/breast-cancer.html
- DenseBreast-info, Inc. Available https://densebreast-info.org//
- Mayo Clinic. Atypical hyperplasia of the breast. Available: https://www.mayoclinic.org/diseases-conditions/atypical-hyperplasia/symptoms-causes/syc-20369773
- Memorial Sloan Kettering Cancer Center. Breast cancer. Available: https://www.mskcc.org/cancer-care/types/breast
- National Cancer Institute. Breast cancer prevention (PDQ)-Health professional version. Available: https://www.cancer.gov/types/breast/hp/breast-prevention-pdq#_579_toc
- NCCN Clinical Practice Guidelines in Oncology: Breast cancer Screening and Diagnosis. V1.2022. Available: https://www.nccn.org/professionals/physician_gls/pdf/breast-screening.pdf
- Niknejad, MT. Breast imaging-reporting and data system. 2022 Jul. Available: https://radiopaedia.org/articles/breast-imaging-reporting-and-data-system-bi-rads?lang=us
- Terese Winslow LLC, Medical and scientific illustration. Breast. Available: https://www.teresewinslow.com/ - /breast/
- Travis LB et al. Cumulative absolute breast cancer risk for young women treated for Hodgkin lymphoma. J Natl Cancer Inst. 2005 Oct 5;97(19):1428-37. PMID: 16204692.

44