Breast Cancer Screening

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Disclosures

No conflict of interest to disclose

Objectives

- Screening for Breast Cancer is Important
- Breast Cancer Screening Tools
- How to Screen
- Risk Assessments and High-Risk Groups
- Breast Density Matters
- Future Directions

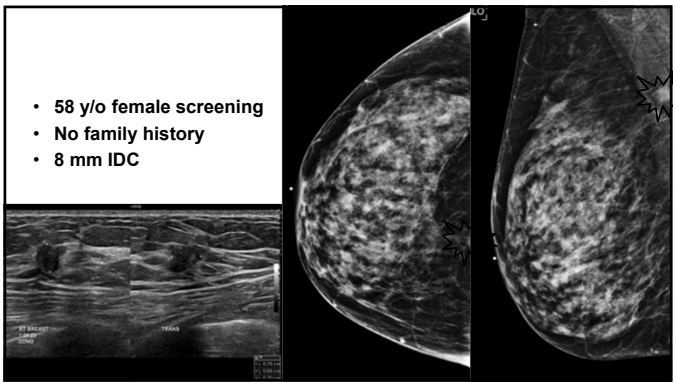
Breast Cancer Screening Matters

- Breast Cancer is the #1 most common cancer among women worldwide
- Estimated 310,000+ new invasive cases expected in the US with 42,000+ deaths in 2024
- Localized breast cancer has 5 year survival of 99%
- Screening mammography leads to 20-**40% reduction in breast cancer mortality**
- Early Detection → improved outcomes, improved treatment options, improved quality of life

Lifetime Breast Cancer Risk

- **1 in 8 women** in the US will be diagnosed with breast cancer during their lifetime
- Risk of breast cancer risk increases with age
- **Most women diagnosed with breast cancer have no family history or known genetic predisposition**
- Some groups can have higher incidence rates or worse outcomes
  - African American Women – tend to be diagnosed at a younger age with more aggressive subtypes and higher mortality rates

- **58 y/o female screening**
- **No family history**
- **8 mm IDC**



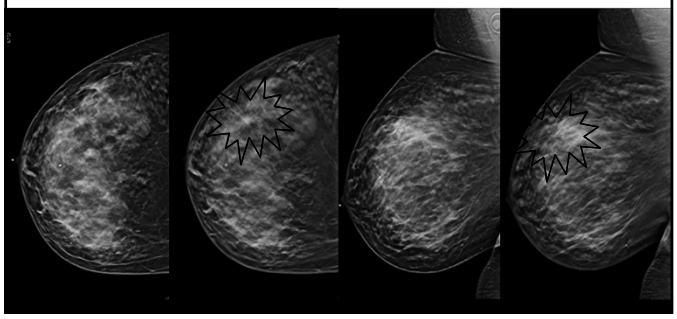
Breast Cancer Screening Tools

- Screening performance depends on appropriate screening methodology
- Quality matters!
- Mammography
  - Gold standard, proven mortality benefit
- Breast Ultrasound
  - Supplements mammography in dense breasts
- Breast MRI
  - Highest sensitivity, for high-risk patients
- Newer Modalities
  - Contrast Enhanced Mammography (CEM)

Screening Mammography

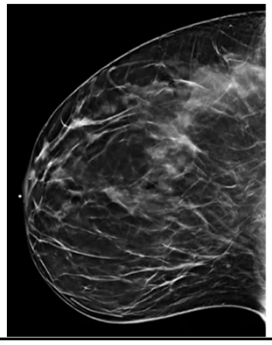
- Gold standard for breast cancer screening
- **Proven to reduce breast cancer mortality**
- 20-40% reduction in mortality
- Widely available and familiar to patients
- **Tomosynthesis / 3D (DBT) mammograms improve cancer detection rate AND reduce recall rate (false positives rate)**
- Limitations: reduced sensitivity in dense breasts

42 y/o female screening / No Family History / 2 cm IDC

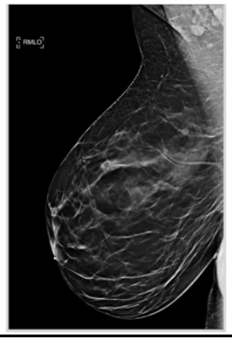


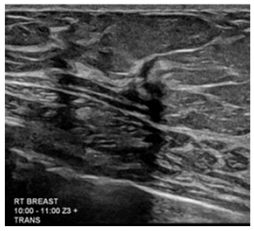
47 y/o female Screening
No Family History
6 mm IDC

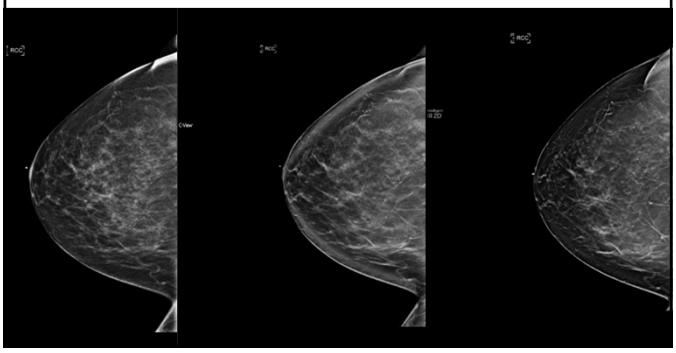
Video – 2D



Video – 3D



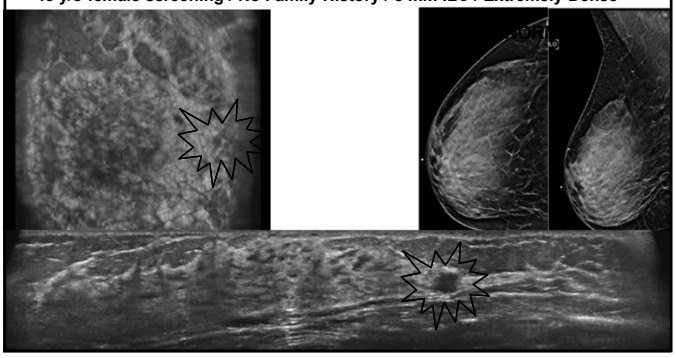




Screening Breast Ultrasound

- Primarily supplemental tool for women with dense breasts
- Ultrasound not impacted by dense breasts
- Well tolerated – no IV or radiation
- Finds cancers missed by mammography in dense breasts
- Limitations: **MRI finds significantly more breast cancers than US**
- Limitations: **False positives**

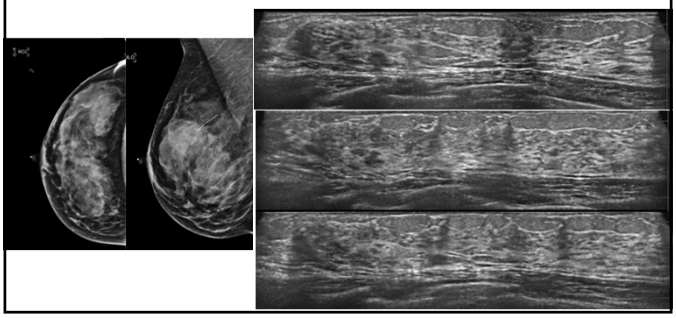
43 y/o female screening / No Family History / 8 mm ILC / Extremely Dense

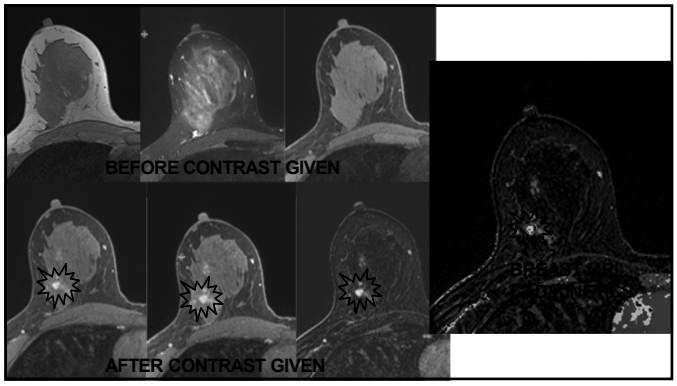


Screening Breast MRI

- Supplemental tool for women at high risk
- **Highest sensitivity for breast cancer detection**
- Identifies an additional 10-15 cancers per 1000
- Used in conjunction with screening mammography
- Do not need screening US and screening MRI
  - MRI will find the cancers that would be seen under US
- Limitations: cost, contrast, claustrophobia

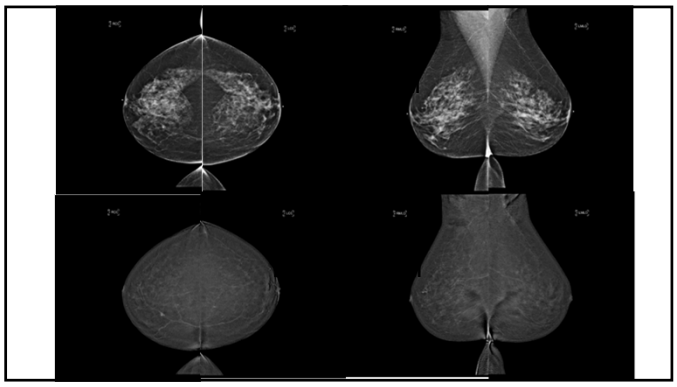
50 y/o female screening / Family History Risk > 20% / Het Dense Breasts

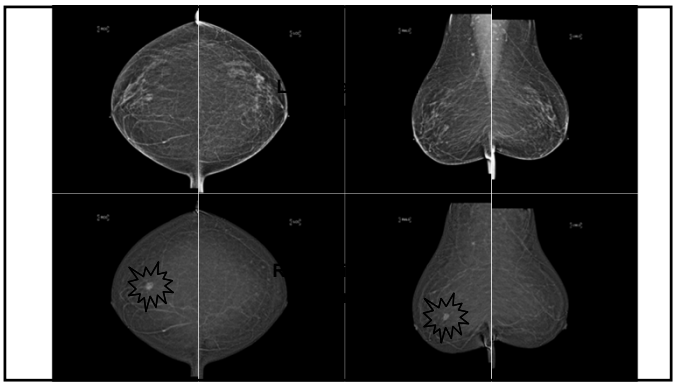




CEM – Contrast Enhanced Mammo

- New(er) tool for breast imaging
- Uses Mammography modality but with ability to acquire high and low energy images
- Administer IV iodinated contrast (like CT)
- Functional exam – generates recombined images – like subtraction images
- Evolving use in breast imaging
  - Diagnostic, trouble shooting, extent of disease, etc
  - Contraindication to MRI for high risk – maybe more frequent use





Breast Cancer Screening Guideline

- American College of Radiology (ACR) and Society of Breast Imaging (SBI):
- **Risk assessment by age 25**
- **Annual Mammography start at age 40**
- Annual Mammography continues past age 74
  - **No upper age limit** unless comorbidities limit life expectancy
- Patients should be allowed to weigh benefits and risks when deciding to screen

Breast Cancer Screening Confusion

- ACR/SBI and USPSTF and American Cancer Society **all agree most lives saved with annual screening**
- Certain groups of women such as black women, Ashkenazi Jewish women and some other minorities develop breast cancer before age 50 at a higher rate than non-Hispanic white women
- Essential to determine who is high risk before screening needed (assess risk by age 25)
- Annual screening at age 40 – saves most lives

Breast Cancer Higher Risk Populations

- **Genetic Mutation Carriers**
- **Calculated lifetime risk > 20%**
- **Personal history of chest radiation while young**

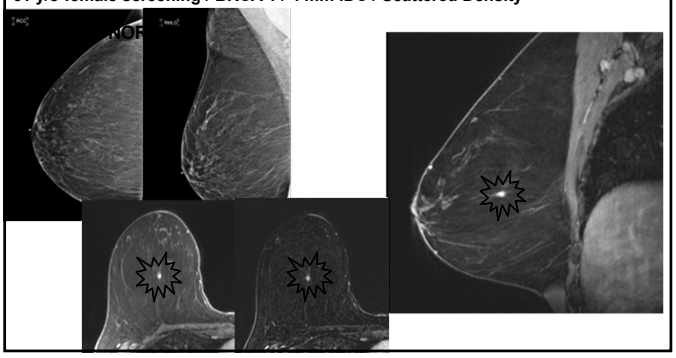
- Personal history of breast cancer
- History of atypia/LCIS

- Dense breast tissue

Breast Cancer High Risk Populations

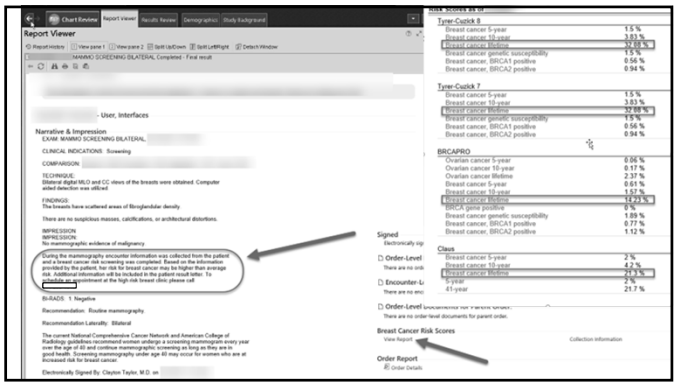
- Genetic Mutation Carriers (untested 1st relatives)
- ATM, **BRCA1/BRCA2**, BARD1, CDH1, CHEK2, NF1, PALB2, PTEN, RAD51C/D, STK11, TP53
- **Annual Mammography at age 30**
- **Annual MRI at age 25**

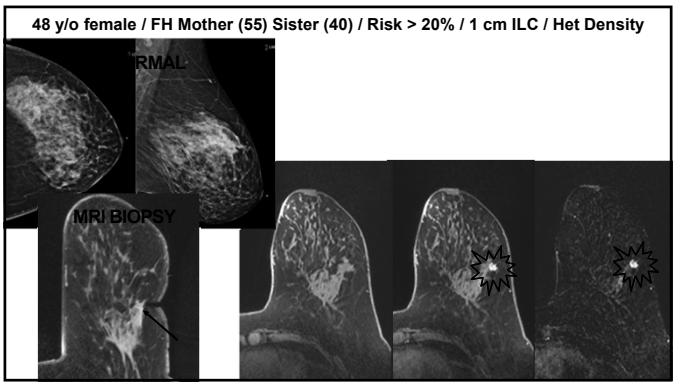
61 y/o female screening / BRCA 1 / 4 mm IDC / Scattered Density



Breast Cancer High Risk Populations

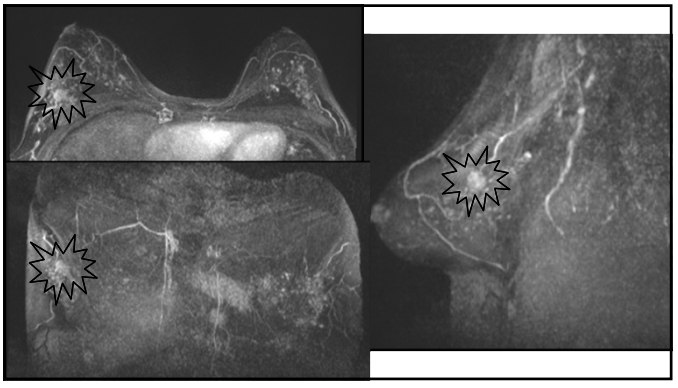
- Calculated lifetime risk > 20%
- Tyrer-Cuzick (v8)
  - Likely most accurate
  - Includes breast density
- BRCAPRO, BOADICIEA, BCSC, Gail
- **Annual Mammography at age 30**
- **Annual MRI at age 30**





Breast Cancer High Risk Populations

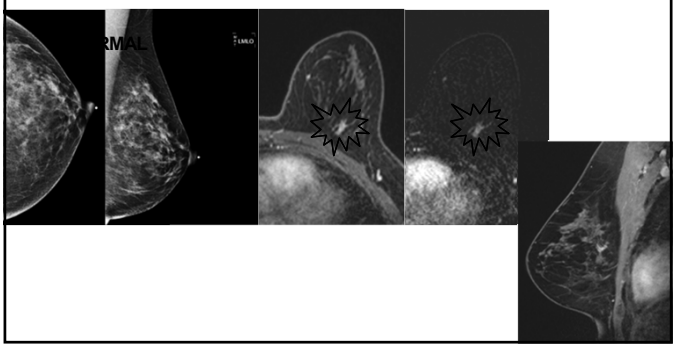
- Personal history of chest radiation while young
- Radiation that includes chest/breast prior to age 30
- Most breast cancers are seen in the upper outer breast as well as the lower inner breast within the mantle field
- **Annual Mammography and MRI**
- **Start age 25 or 8 years after radiation therapy**



Breast Cancer High Risk Populations

- **Personal history of breast cancer and dense breast tissue**
  OR
- **Personal history of breast cancer diagnosed before age 50**
- Heterogeneous group – age of diagnosis, subtypes, treatment, hormone therapy – will impact risk.
- **Annual Mammogram and Annual Breast MRI**

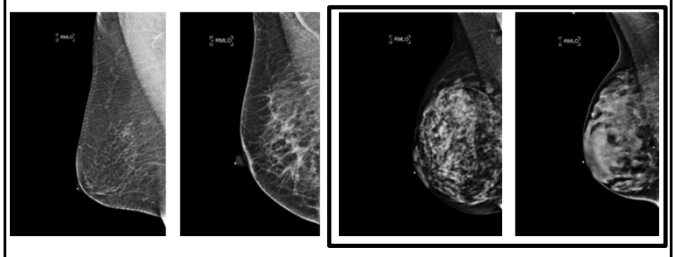
61 y/o female screening / Personal History BC / 1 cm IDC + DCIS / Het Dense



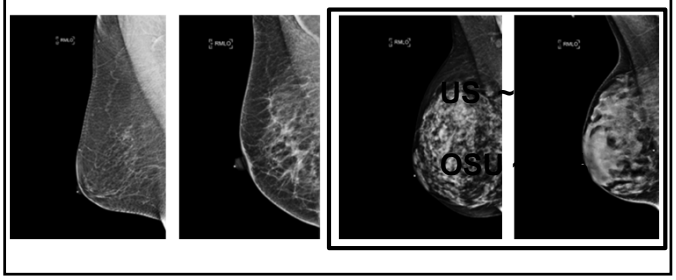
Breast Density

- **Breast density determined by mammography**
- BI-RADS Lexicon Breast Density Categories
  - The breasts are almost entirely fatty
  - There are scattered areas of fibroglandular density
  - **The breasts are heterogeneously dense, which may obscure small masses**
  - **The breasts are extremely dense, which lowers the sensitivity of mammography**

Breast Density



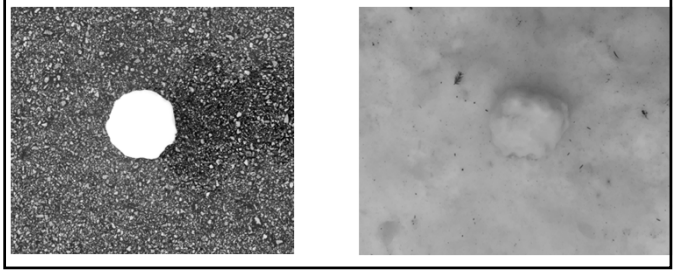
Breast Density



Breast Density - Masking

- As breast density increases mammographic sensitivity decreases
- Dense breast tissue and breast cancer are similar density on mammography, overlap causes **masking**
- Challenging and sometimes impossible to find breast cancers in dense breasts
- **Like trying to find a snowball in a snowstorm…**

Breast Density



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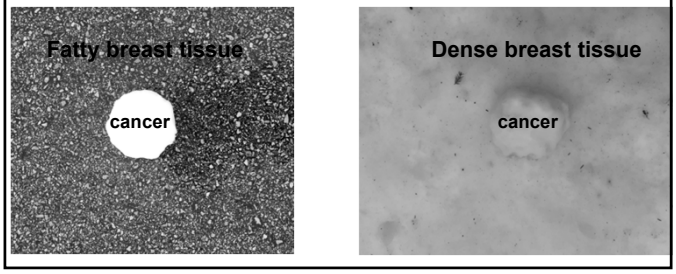
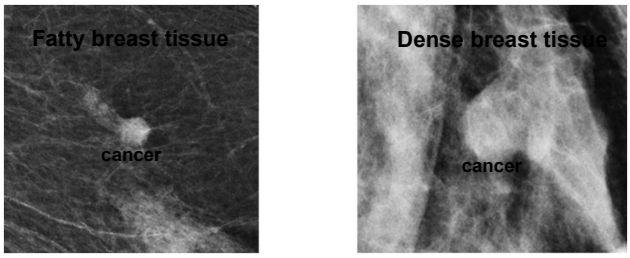
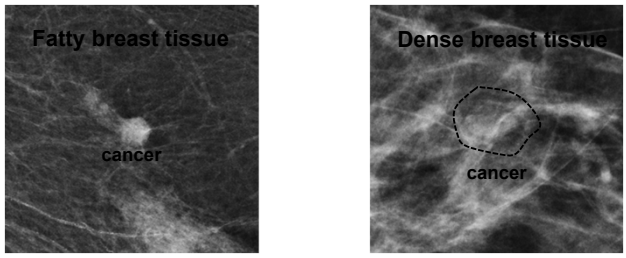


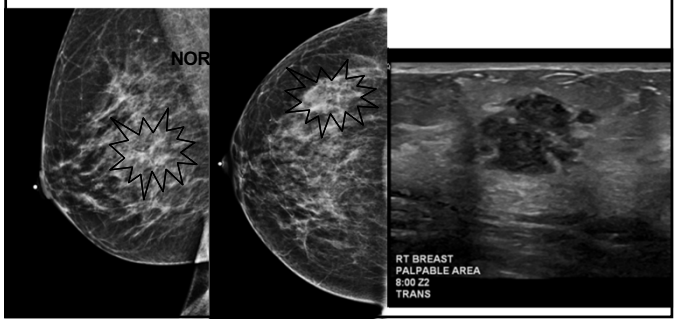
Breast Density



Breast Density



52 y/o female screening / No Fam History / 2 cm IDC / Het Dense

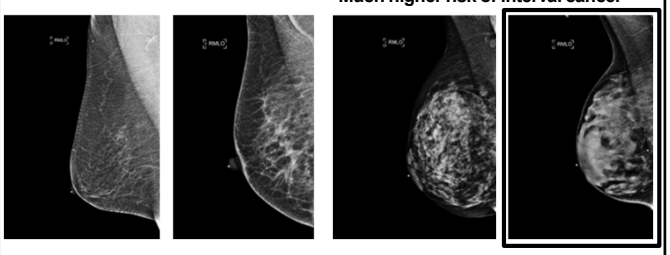


Breast Density - Risk

- **Women with dense breasts are at elevated risk for breast cancer**
- Risk for breast cancer increases as density increases
- Studied heavily with relative risk typically found to be around four-fold increase between extremes in density
- Differences in risk comparing extreme densities are large
- Differences in risk comparing similar densities are smaller

Breast Density

Extremely Dense Breasts:
Much lower sensitivity
Much higher risk of breast cancer
Much higher risk of interval cancer



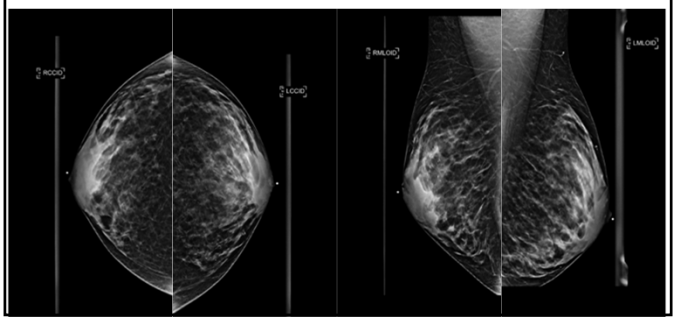
Dense Breast Screening

- Dense breasts **increase risk of breast cancer** and **increase chance of missing breast cancer** on mammography
- Can supplement annual mammography (3D) with:
- Screening US (Handheld or Automated (ABUS))
  - Well tolerated, no IV / Finds fewer cancer, false +
- Screening Breast MRI with contrast
  - Finds the most cancers / More expensive, requires IV

Transgender Breast Cancer Screening

- Transfeminine (male to female) patients
  - 40+ y/o and 5 years hormone use
    - Annual Mammography
- Transmasculine (female to male) patients
  - Bilateral Mastectomies (top surgery)
    - No imaging
  - 40+ y/o and reduction mammoplasty/no surgery
    - Annual Mammography
    - If high risk can add Annual MRI

56 y/o transgender female (male to female) / 7 years hormone use / Het Dense



Breast Cancer Screening Stats

- What should you expect?
- Data from NMD 2008-2021
- Screening Mammography
- Recall Rate 10%
- CDR 4.2 per 1000
- PPV of callback 4.2%
- PPV of biopsy 25.8%

Screening Workup

1. Screening Mammogram
2. Recall from Screening
   Additional Mammogram
   Breast Ultrasound
3. Breast Biopsy
   US or Stereotactic Biopsy

Future of Breast Cancer Screening

- AI, AI, AI
  - Cancer Detection
  - Decision Support / Triage
  - Image Acquisition / Image Augmentation
  - Risk Assessment
- Further Personalized Screening
  - CEM (Contrast Enhanced Mammography)
  - Abbreviated Breast MRI

Breast Cancer Screening Strategy

- Patient high risk? Evaluate risk by age 25
  - **HIGH RISK SCREENING (Annual Mammo + MRI)**
- Patient over 40 and not high risk?
  - **ANNUAL MAMMOGRAPHY (3D)**
- Patient with Dense Breasts?
  - Consider supplemental screening

Selected References/Resources

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