Breast Density Legislation: Implications for primary care providers

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Associate Professor of Medicine
Disclosure

• Relevant financial relationship(s)
  • None

• Off-label usage
  • None
Learning Objectives

• Review recent breast cancer screening literature

• Understand implications of breast density on breast cancer detection and risk

• Discuss with patients the risks and benefits of supplemental screening in the dense breast

• Compare the relative advantages and disadvantages of supplemental screening techniques
Recent mammography studies have emphasized screening harms over benefits

1. False positive result
2. Overdiagnosis
3. Costs
4. False negative result
The message from the elite journals

• **NEJM**
  - Effect of Three Decades of Screening Mammography on Breast-Cancer Incidence
  - Effect of Screening Mammography on Breast-Cancer Mortality in Norway

• **JAMA**
  - Mammography No Benefit in Reducing Deaths From Breast Cancer
  - A Systematic Assessment of Benefits and Risks to Guide Breast Cancer Screening Decisions

• **Annals of Internal Medicine**
  - Annual mammography screening did not reduce long-term breast cancer mortality in women 40 to 59 years of age
  - Aggregate Cost of Mammography Screening in the U.S.: Comparison of Current Practice and Advocated Guidelines
  - Overdiagnosis of Invasive Breast Cancer Due to Mammography Screening: Results From the Norwegian Screening Program
A Systematic Assessment of Benefits and Risks to Guide Breast Cancer Screening Decisions

Lydia E. Pace, MD, MPH; Nancy L. Keating, MD, MPH

- Breast cancer mortality reduction: 19%
- Cancer overdiagnosis rate: 19%
- Risk of false positive after ten years of cumulative mammography: 61%

JAMA 2014; 311(13):1327-1335
Effect of Three Decades of Screening Mammography on Breast-Cancer Incidence

Archie Bleyer, M.D., and H. Gilbert Welch, M.D., M.P.H.

CONCLUSIONS
Despite substantial increases in the number of cases of early-stage breast cancer detected, screening mammography has only marginally reduced the rate at which women present with advanced cancer. Although it is not certain which women have been affected, the imbalance suggests that there is substantial overdiagnosis, accounting for nearly a third of all newly diagnosed breast cancers, and that screening is having, at best, only a small effect on the rate of death from breast cancer.
November 23, 2012

Mammograms lead to breast cancer "overdiagnosis" in 1 million women, study finds

A big U.S. study published in the Nov. 22, 2012 New England Journal of Medicine shows that mammograms have done surprisingly little to catch deadly cancers before they spread and have led more than a million women to be treated for growths that never would have threatened their lives. / AP
Costs

- Annual # mammograms performed: 50 million
- Annual expenditures 2010: $7.8 billion
  - Cost model does not incorporate newer technologies or supplemental screening
Twenty five year follow-up for breast cancer incidence and mortality of the Canadian National Breast Screening Study: randomised screening trial

With mammograms

44,925 women received breast exams and mammograms
3,250 women had diagnoses with breast cancer
500 women died from breast cancer

Without mammograms

44,910 women received breast exams
3,133 women had diagnoses with breast cancer
505 women died from breast cancer

The death rate from breast cancer was the same in both groups, but 1 in 424 women who had mammograms received unnecessary cancer treatment, including surgery, chemotherapy and radiation.
Switzerland debates dismantling its breast cancer screening programme

A row has erupted in Switzerland after the Swiss Medical Board recommended that the country’s mammography screening programme for breast cancer be suspended because it leads to too many unnecessary interventions.

In a report made public on 2 February, the board said that while systematic mammography screening for breast cancer saved 1-2 women’s lives for every 1000 screened, it led to unnecessary investigations and treatment for around 100 women in every 1000.1
Figure 1. Female Breast Cancer Incidence Rates* by Stage**, US, 1975-2007

*Rates are age-adjusted to the 2000 US standard population.
**Localized – confined to primary site in breast; regional – spread to regional lymph nodes; distant – cancer has metastasized.

Leading causes of cancer death among U.S. women; American Cancer Society 2013

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Deaths</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung &amp; bronchus</td>
<td>72,220</td>
<td>26%</td>
</tr>
<tr>
<td>Breast</td>
<td>39,620</td>
<td>14%</td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>24,530</td>
<td>9%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>18,980</td>
<td>7%</td>
</tr>
<tr>
<td>Ovary</td>
<td>14,030</td>
<td>5%</td>
</tr>
<tr>
<td>Leukemia</td>
<td>10,060</td>
<td>4%</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>8,430</td>
<td>3%</td>
</tr>
<tr>
<td>Uterine corpus</td>
<td>8,190</td>
<td>3%</td>
</tr>
<tr>
<td>Liver &amp; intrahepatic bile duct</td>
<td>6,780</td>
<td>2%</td>
</tr>
<tr>
<td>Brain &amp; other nervous system</td>
<td>6,150</td>
<td>2%</td>
</tr>
<tr>
<td>All sites</td>
<td>273,430</td>
<td>100%</td>
</tr>
</tbody>
</table>
Can the balance be shifted?
What are the consequences of screening?

- Benefit?
- Risks / Harms?
  1. False positive result
  2. Overdiagnosis
  3. Costs
  4. False negative result
Case

• 55 year-old asymptomatic woman presents for routine mammographic screening
• Gravida 0
• Menarche age 11
• Menopause age 47; started HT
• Sister had breast cancer at age 54
EXAM: Bilateral digital screening mammogram. Computer-aided detection equipment was used during interpretation.

COMPARISON: Prior Mayo Clinic mammograms.

DENSITY: Extremely dense. This may lower the sensitivity of mammography.

FINDINGS: Scattered benign-appearing calcifications in both breasts.

ASSESSMENT: Negative.
What is her most significant risk for breast cancer?

A. Sister’s diagnosis of breast cancer
B. Long-term use of hormone therapy
C. Breast density
D. Nulligravidity
### Risk Factors for Breast Cancer

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>BRCA1 or BRCA2 mutation</em></td>
<td>10.0–32.0</td>
</tr>
<tr>
<td>Family history of cancer (no known mutation)†</td>
<td></td>
</tr>
<tr>
<td>1 first-degree relative</td>
<td>1.5–2.0</td>
</tr>
<tr>
<td>2 first-degree relatives</td>
<td>3.0</td>
</tr>
<tr>
<td>3 or more first-degree relatives</td>
<td>4.0</td>
</tr>
<tr>
<td>1 second-degree relative</td>
<td>1.2–1.5</td>
</tr>
<tr>
<td>Therapeutic radiation to chest at &lt;30 yr of age‡</td>
<td>7.0–17.0</td>
</tr>
<tr>
<td><strong>Hormonal factors</strong></td>
<td></td>
</tr>
<tr>
<td>Late (age &gt;30 yr) parity or nulliparity</td>
<td>1.2–1.7</td>
</tr>
<tr>
<td>Early (age &lt;12 yr) menarche or late menopause (age &gt;55 yr)</td>
<td>1.2–1.3</td>
</tr>
<tr>
<td>Combined hormone-replacement therapy (e.g., for 10 or more yr)</td>
<td>1.5</td>
</tr>
<tr>
<td>Postmenopausal obesity</td>
<td>1.2–1.9</td>
</tr>
<tr>
<td>Alcohol consumption (2 drinks/day vs. none)</td>
<td>1.2</td>
</tr>
<tr>
<td>Smoking before first live birth</td>
<td>1.2</td>
</tr>
<tr>
<td>Sedentary lifestyle</td>
<td>1.1–1.8</td>
</tr>
<tr>
<td>White race</td>
<td>1.1–1.5</td>
</tr>
<tr>
<td>Breast density (very dense vs. mainly fatty)</td>
<td>5.0</td>
</tr>
<tr>
<td>Atypical ductal or lobular hyperplasia or lobular carcinoma in situ on previous breast biopsy</td>
<td>4.0</td>
</tr>
</tbody>
</table>

* Data are in part from Tice and Kerlikowske, 2009.³

† Family history refers to breast or ovarian cancer. The risk varies with the age of the patient and that of the affected relative (or relatives). Women at very high risk may require earlier or additional screening.

‡ Women under 30 years of age who have undergone therapeutic radiation to the chest require earlier and additional screening.

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If she has breast cancer, what is the likelihood that it will be visible on her mammogram?

A. < 55%
B. 55 - 69%
C. 70 - 89%
D. ≥ 90%
EXAM: Bilateral digital screening mammogram. Computer-aided detection equipment was used during interpretation.

COMPARISON: Prior Mayo Clinic mammograms.

DENSITY: Extremely dense. This may lower the sensitivity of mammography.

FINDINGS: Scattered benign-appearing calcifications in both breasts.

ASSESSMENT: Negative.
The breasts are almost entirely fatty

There are scattered areas of fibroglandular densities

The breasts are heterogeneously dense which may obscure small masses

The breasts are extremely dense which obscures small masses

Kolb et al; Radiology 2002
New Bi-RADS Breast Density Classification

The breasts are almost entirely fatty

There are scattered areas of fibroglandular densities

The breasts are heterogeneously dense which may obscure small masses

The breasts are extremely dense which obscures small masses
The problem with mammography:
Tumors and breast density both appear white

Mammograms from two different women
Both had 1 cm invasive ductal adenocarcinoma
Extremely dense breast: palpable tumor is mammographically occult

Palpable nodule marked with BB

Diagnostic mammography

US palpable nodule: 1 cm invasive ductal cancer
74% have dense breasts at age 40-50
36% have dense breasts at age 70-80
The risk of a false negative mammogram correlates strongly with age

Table 3. Breast Cancer Occurrence, Detection, Missed Cancers, Sensitivity, and Specificity in the Screened Sample, by Age, Breast Density, and Hormone Replacement Therapy Use*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Screening Mammograms</th>
<th>Cases of Cancer</th>
<th>Adjusted Cancer Rate per 1000 Screening Examinations†</th>
<th>Adjusted True-Positives per 1000 Screening Examinations†</th>
<th>Adjusted False-Negatives per 1000 Screening Examinations†</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>All eligible women</td>
<td>463 672</td>
<td>2223</td>
<td>4.8</td>
<td>3.6</td>
<td>1.2</td>
<td>75.0</td>
<td>92.3</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–44 y</td>
<td>51 729</td>
<td>125</td>
<td>2.0</td>
<td>1.4</td>
<td>0.6</td>
<td>65.6</td>
<td>90.9</td>
</tr>
<tr>
<td>45–49 y</td>
<td>71 385</td>
<td>218</td>
<td>2.7</td>
<td>2.0</td>
<td>0.8</td>
<td>69.7</td>
<td>90.7</td>
</tr>
<tr>
<td>50–54 y</td>
<td>80 939</td>
<td>328</td>
<td>3.9</td>
<td>2.9</td>
<td>1.0</td>
<td>72.9</td>
<td>91.6</td>
</tr>
<tr>
<td>55–59 y</td>
<td>67 563</td>
<td>325</td>
<td>4.8</td>
<td>3.6</td>
<td>1.2</td>
<td>73.8</td>
<td>92.3</td>
</tr>
<tr>
<td>60–69 y</td>
<td>104 921</td>
<td>611</td>
<td>5.9</td>
<td>4.2</td>
<td>1.7</td>
<td>73.3</td>
<td>93</td>
</tr>
<tr>
<td>70–79 y</td>
<td>70 405</td>
<td>501</td>
<td>7.1</td>
<td>5.7</td>
<td>1.4</td>
<td>81.4</td>
<td>94.1</td>
</tr>
<tr>
<td>80–89 y</td>
<td>16 730</td>
<td>115</td>
<td>7.3</td>
<td>5.9</td>
<td>1.5</td>
<td>86.1</td>
<td>94.3</td>
</tr>
<tr>
<td>Breast density group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almost entirely fatty</td>
<td>42 237</td>
<td>110</td>
<td>2.2</td>
<td>1.9</td>
<td>0.2</td>
<td>88.2</td>
<td>96.5</td>
</tr>
<tr>
<td>Scattered fibro glandular tissue</td>
<td>218 129</td>
<td>975</td>
<td>4.2</td>
<td>3.5</td>
<td>0.8</td>
<td>82.1</td>
<td>93</td>
</tr>
<tr>
<td>Heterogeneously dense</td>
<td>167 003</td>
<td>945</td>
<td>5.8</td>
<td>4.1</td>
<td>1.8</td>
<td>68.9</td>
<td>90.8</td>
</tr>
<tr>
<td>Extremely dense</td>
<td>36 303</td>
<td>193</td>
<td>6.1</td>
<td>3.9</td>
<td>2.2</td>
<td>62.2</td>
<td>89.9</td>
</tr>
<tr>
<td>Current use of HRT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>168 635</td>
<td>1319</td>
<td>4.7</td>
<td>3.5</td>
<td>1.3</td>
<td>76.6</td>
<td>92.6</td>
</tr>
<tr>
<td>No</td>
<td>295 037</td>
<td>904</td>
<td>4.6</td>
<td>3.5</td>
<td>1.1</td>
<td>72.7</td>
<td>91.7</td>
</tr>
</tbody>
</table>

* HRT = hormone replacement therapy.
† Adjusted for mammography registry and the other covariates in the table.

Cause of reduced sensitivity in younger women?

- 21% - faster tumor volume doubling time
- 79% - lower mammographic tumor detectability

Cause of lower mammographic tumor detectability in younger women?

- Factors contributing to mammography failure in women 40-49 years  
  (Buist et al; JNCI 2004;96:1432–40)
  
  - Tumor characteristics
  - Breast density  
    \[68\%\]
  - Mammography quality

- 15-fold increased risk of missed breast cancer in women 40-49 years with extremely dense vs fatty breasts  
  (Kerlikowske, N Engl J Med 2007)
Given her level of risk and density, what is the recommended next step for screening?

A. Automated whole breast ultrasound
B. Tomosynthesis
C. MRI
D. None of the above
The dawn of Breast Density Inform legislation
When I was diagnosed with advanced-stage breast cancer, I went to my doctors and asked what had happened. I had just had a normal mammogram. Two of my doctors said, “Well, Nancy, you have dense breast tissue.” That was the first time I had heard those terms. Here I find out that I have something about my tissue composition that no one ever bothered to tell me.

At the time, and this was nearly a decade ago, I found that there were 10-year-old studies that said mammograms miss every other cancer in dense breasts. I found that dense breast tissue is a well-established predictor of risk, and that most women do not know it. I said to my doctors, “Look what I uncovered. Now can you start telling women about their dense tissue?” They both said no, that it was not the standard of care. It was not the protocol.
Breast Density Inform Legislation by State
HF 2551 as introduced - 88th Legislature (2013 - 2014) Posted on 03/03/2014 02:37pm

A bill for an act
relating to health; requiring a notice to be provided with certain mammogram results; proposing coding for new law in Minnesota Statutes, chapter 144.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [144.1212] NOTICE TO PATIENT; MAMMOGRAM RESULTS.
Subdivision 1. Definition. For purposes of this section, "facility" has the meaning provided in United States Code, title 42, section 263b(a)(3)(A).
Subd. 2. Required notice. A facility at which a mammography examination is performed shall, if a patient is categorized by the facility as having heterogeneously dense breasts or extremely dense breasts based on the Breast Imaging Reporting and Data System established by the American College of Radiology, include in the summary of the written report that is sent to the patient, as required by the federal Mammography Quality Standards Act, United States Code, title 42, section 263b, the following notice:
"Your mammogram shows that your breast tissue is dense. Dense breast tissue is relatively common and is found in more than 40 percent of women. However, dense breast tissue may make it more difficult to identify precancerous lesions or cancer through a mammogram and may also be associated with an increased risk of breast cancer. This information about the results of your mammogram is given to you to raise your own awareness and to help inform your conversations with your treating clinician who has received a report of your mammogram results. Together you can decide which screening options are right for you based on your mammogram results, individual risk factors, or physical examination."
Mayo patients will receive this message in a letter following mammography

"Your mammogram shows that your breast tissue is dense. Dense breast tissue is relatively common and is found in more than 40 percent of women. However, dense breast tissue may make it more difficult to identify precancerous lesions or cancer through a mammogram and may also be associated with an increased risk of breast cancer. This information about the results of your mammogram is given to you to raise your own awareness and to help inform your conversations with your treating clinician who has received a report of your mammogram results. Together you can decide which screening options are right for you based on your mammogram results, individual risk factors, or physical examination."
Breast Density Legislation: Agree or disagree?

• Do women have a right to know their breast density and to understand implications?
  • Limitations of mammography
  • Risk
  • Hormone therapy
    • Breast cancer risk increased in HT users with dense vs. nondense breasts
      (Kerlikowske, JCO, 2010)

• What should women do in regard to supplemental screening?
What are the options?

• Whole breast screening ultrasound
• Tomosynthesis (3D mammography)
• MRI
• Molecular Breast Imaging (MBI)
Screening Ultrasound: ACRIN 6666 trial

- 2,637 women with dense breasts + other risks
- Sensitivity:
  - MMG and US alone 50%
  - Combination 77.5%
- Ultrasound led to more biopsies (only 1/10 cancer)
- Increased cancer detection: 4.2 / 1000 screened
- 2 big limitations
  - Physician performed US
  - High-risk patient population
Automated Whole Breast Ultrasound (AWBU)

Technologist places transducer on the breast; transducer makes several sweeps across the breast; images stored
Assessing Improvement in Detection of Breast Cancer with Three-dimensional Automated Breast US in Women with Dense Breast Tissue: The SomolInsight Study

NEW! Unfamiliar with an abbreviation?

Rachel F. Brem, MD, László Tabár, MD, Stephen W. Duffy, MSc, Marc F. Inciardi, MD, Jessica A. Guingrich, MD, Beverly E. Hashimoto, MD, Marla R. Lander, MD, Robert L. Lapidus, MD, Mary Kay Peterson, MD, Jocelyn A. Rapelyea, MD, Susan Roux, MD, Kathy J. Schilling, MD, Biren A. Shah, MD, Jessica Torrente, MD, Ralph T. Wynn, MD, Dave P. Miller, MS

From the Breast Imaging and Interventional Center, George Washington University Medical Center, 2150 Pennsylvania Ave NW, Washington, DC 20037 (R.F.B., J.A.R., J.T.); Uppsala School of Medicine and Department of Mammography, Falun Central Hospital, Uppsala, Sweden (L.T.); Wolfson Institute of Preventive Medicine, Queen Mary University of London, London, England (S.W.D.); Department of Pathology and Laboratory Medicine, University of Kansas Medical Center, Kansas City, Kan (M.F.I.); Department of Radiology, OSF Saint Francis Medical Center, Peoria, Ill (J.A.G.); Department of Radiology, Virginia Mason Medical Center, Seattle, Wash (B.E.H.); Department of Radiology, Desert Regional Comprehensive Cancer Center, Palm Springs, Calif (M.R.L.); Department of Radiology, Doctor’s Hospital, Opelousas, La (R.L.L.); Radiology Regional Center, Fort Myers, Fla (M.K.P.); Carol Hatton Breast Care Center, Community Hospital of the Monterey Peninsula, Monterey, Calif (S.R.); Boca Radiology Group, Boca Raton Regional Hospital, Boca Raton, Fla (K.J.S.); Department of Radiology, Henry Ford Hospital, Detroit, Mich (B.A.S.); Department of Radiology, Columbia University Medical Center, New York, NY (R.T.W.); and ICON Clinical Research, San Francisco, Calif (D.P.M.).

DOI: http://dx.doi.org/10.1148/radiol.14132832
Automated whole breast US (ABUS)

- 15,318 women with dense breasts screened
- MMG followed by US; read sequentially
- Additional yield of US:
  - 1.9 cancers per 1000 screened
- Increase in recall rate: 28%
Breast ultrasound as a screening tool

• Advantages
  • Relatively low cost
  • Painless
  • No radiation
  • Biopsy easy to perform

• Limitations
  • Minimal increase in cancer detection
  • High false positive rate*
  • Operator dependent
  • Generates many images
Tomosynthesis: 3D mammography
MASS

INFILTRATING DUCTAL CANCER
Abnormal Screening Mammogram

Pseudolesion

Tomo MLO

Tomo CC
Digital tomosynthesis

• Advantages:
  • Reduces recall rate (from 11% to 7%)
  • Relatively low cost
  • Low radiation
  • Biopsy easy to perform

• Disadvantages:
  • Minimal increase in cancer detection
  • Generates many images (reading time)
  • Still an anatomic modality
Magnetic Resonance Imaging (MRI)
Magnetic Resonance Imaging (MRI)
Magnetic Resonance Imaging (MRI)
MRI

• Advantages:
  • High sensitivity: highest detection rate
  • No radiation

• Disadvantages:
  • Cost
  • Complexity
  • High recall rate
  • Contra-indications
    • Claustrophobia, implantable devices, gadolinium
Who Should Have a Screening Breast MRI?  
American Cancer Society Guidelines 2007

- [http://CAonline.AmCancerSoc.org](http://CAonline.AmCancerSoc.org)

- Annual screening MRI recommended:
  - BRCA mutation or other high-risk syndrome
  - 1\textsuperscript{o} relative of BRCA carrier; untested
  - Radiation to chest between ages 10 & 30
  - Lifetime risk $\geq 20\text{-}25\%$ (family history-based models)
    - “Ibis tool” – “Risk evaluator software” - download

- Data insufficient for:
  - Prior breast cancer, DCIS, LCIS, atypia
  - Dense breasts on mammography
Molecular Breast Imaging (MBI)

- Functional not anatomic imaging; differences in behavior of tumor cells not affected by breast density
- Injection of low-dose radiotracer with preferential uptake in tumor cells
- Uses 2 high resolution gamma cameras
- 4 views per breast
MBI for Screening in Dense Breasts

Funded by Susan G. Komen for the Cure

- Eligibility criteria:
  - Asymptomatic
  - Presenting for routine screening mammography
  - Heterogeneously or extremely dense breasts
  - Screening mammogram and MBI read blindly

Rhodes et al. Radiology, Jan 2011
# MBI Screening Data

## The Mayo Experience in 2600 women

<table>
<thead>
<tr>
<th></th>
<th>Cancers detected (no.)</th>
<th>Sensitivity (%)</th>
<th>Cancers detected per 1000 screened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammography alone</td>
<td>8/32</td>
<td>25</td>
<td>3.1</td>
</tr>
<tr>
<td>MBI alone</td>
<td>26/32</td>
<td>81</td>
<td>10.1</td>
</tr>
<tr>
<td>Mammography + MBI</td>
<td>29/32</td>
<td>91</td>
<td>11.3</td>
</tr>
</tbody>
</table>

Rhodes, Hruska, Conners, O’Connor. *Radiology* 2011
Rhodes, Hruska, Conners, O’Connor. *AJR* in press
## MBI: Radiation exposure

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Effective dose (mSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammogram</td>
<td>0.5</td>
</tr>
<tr>
<td>Mammogram plus tomosynthesis</td>
<td>1.0</td>
</tr>
<tr>
<td>MBI ~ 6-7 mCi</td>
<td>2.0</td>
</tr>
<tr>
<td>CT chest</td>
<td>8</td>
</tr>
<tr>
<td>Nuclear medicine stress test</td>
<td>11</td>
</tr>
<tr>
<td>CT abdomen/pelvis</td>
<td>15</td>
</tr>
<tr>
<td>CT urogram</td>
<td>36</td>
</tr>
</tbody>
</table>
Breast Cancer Detected on Screening MBI but not on Screening Mammogram

Mammogram March 2009
Mammogram March 2011
MBI March 2011

Grade II Invasive Ductal Carcinoma, 1.9 cm
Breast Cancer Detected on Screening MBI but not on Screening Mammogram

Mammogram November 2008

Mammogram October 2010

MBI October 2010

Grade III Invasive Lobular Carcinoma, 3.6 cm; node positive
Breast Cancer Detected on Screening MBI but not on Screening Mammogram

Mammogram March 2010
Mammogram March 2011
MBI March 2011

Grade II Invasive Ductal Carcinoma, 4.1 cm
MBI

• Advantages
  • Highest additional cancer detection rate second to MRI at lower cost
  • Low false positive rate

• Disadvantages
  • Requires injection
  • Additional radiation
  • Insurance coverage variable
  • No direct biopsy capability
## Comparing Screening Modalities in Dense Breasts

<table>
<thead>
<tr>
<th></th>
<th>Recall Rate (%)</th>
<th>Cancers per 1000</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammography alone</td>
<td>10%</td>
<td>3-5</td>
<td>$</td>
</tr>
<tr>
<td>+ Tomosynthesis</td>
<td>Down 5-16%</td>
<td>+ 1.2-2.8</td>
<td>$</td>
</tr>
<tr>
<td>+ Ultrasound</td>
<td>Up 13-28%</td>
<td>+ 1.9-2.5</td>
<td>$</td>
</tr>
<tr>
<td>+ MBI</td>
<td>Up 10%</td>
<td>+ 9</td>
<td>$$</td>
</tr>
<tr>
<td>+ MRI</td>
<td>Up 28%</td>
<td>+ 15</td>
<td>$$$</td>
</tr>
</tbody>
</table>

Ciatto 2013; Skaane 2013; Berg 2012; Rhodes 2011; Brem 2014
Which Modality to Choose?

- False positives and false negatives occur with every modality
- Local access
  - Mayo sites will not offer screening US
  - Tomosynthesis will likely replace 2D digital mammography over the next few years - will likely not solve supplemental screening gap
- Insurance coverage
  - States differ; some mandate coverage
  - Insurance plans differ
Until guidelines exist, what to do now?

- Educate about density
  - Pursue additional imaging for persistent breast change even if mammogram normal
  - Determine eligibility for screening MRI
  - Schedule mammogram during days 3-14 of menstrual cycle when density is lower
  - Caution about increased risk of density + HT

- Supplemental screening is an individual choice; shared decision making after discussion of benefits and harms
Talking points for discussions with patients

• Breast density is common (40% of screening-eligible women)

• Supplemental screening is an individual choice
  • There is currently no consensus in the national radiology community about whether supplemental screening is warranted or what supplemental screening modality offers the best risk-to-benefit ratio

• Potential benefits of supplemental screening:
  • May detect tumors obscured by mammographic breast density
  • May detect tumors at an earlier stage than mammography, allowing for less invasive treatments

• Potential risks:
  • Insurance may not cover the cost of supplemental screening tests
  • It is unknown whether supplemental screening for breast cancer results in a reduction in breast cancer mortality
  • Supplemental screening may result in overdiagnosis (the detection of a cancer that would otherwise not go on to cause symptoms or death)
  • Supplemental screening may increase the risk of false-positive findings. Most supplemental screening modalities increase false-positive findings and biopsies, with the exception of tomosynthesis, which decreases the false-positive rate