Breast Health

Doug Martin M.D.
Medical Director Dept of Radiology CRMC
Quantum Radiology
Breast Cancer Statistics

(2015 USA Data)

- 2\textsuperscript{nd} Highest Diagnosed cancer in women (Skin) – 30% of all newly dx cancers
- 2\textsuperscript{nd} Highest cancer deaths in women (Lung)
- Breast cancer risk doubles if you have a first degree relative with Breast cancer (mother, daughter, sister)
- Only 15% of Breast cancer pts have a family history

(Breastcancer.org)

- 292,000 new cases Breast cancer (80% invasive)- Women
- 2,350 cases in men
- 40,290 fatal cases
- >2.8 million women have a history of Breast cancer
Comparison to Heart Disease

- Includes heart disease, HTN, and stroke
- #1 killer of women (1/2 million/year)
- Kills more than the next seven causes of death combined
- Women are 15% more likely to die of a heart attack than men
- Only 34% of women correctly identified heart disease as the leading cause of death.
Breast cancer diagnoses by age — U.S. women

<table>
<thead>
<tr>
<th>Age Group</th>
<th>% of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 20</td>
<td>0.0%</td>
</tr>
<tr>
<td>20-34</td>
<td>1.8%</td>
</tr>
<tr>
<td>35-44</td>
<td>9.9%</td>
</tr>
<tr>
<td>45-54</td>
<td>22.5%</td>
</tr>
<tr>
<td>55-64</td>
<td>24.8%</td>
</tr>
<tr>
<td>65-74</td>
<td>20.2%</td>
</tr>
<tr>
<td>75-84</td>
<td>15.1%</td>
</tr>
<tr>
<td>85+</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

Age and Breast Cancer Risk

- By age 25: one in 19,608
- By age 30: one in 2,525
- By age 35: one in 622
- By age 40: one in 217
- By age 45: one in 93
- By age 50: one in 50
- By age 55: one in 33
- By age 60: one in 24
- By age 65: one in 17
- By age 70: one in 14
- By age 75: one in 11
- By age 80: one in 10
- By age 85: one in 9
- Ever: one in 8
Survival Rates

- At 5 Years: 89%
- At 10 years: 82%
- At 15 years: 77%

**The key to surviving the disease is early detection. If detected and treated early, the 5 year relative survival rate for localized breast cancer is 99%**
Trends

• Breast Cancer incidence rates began decreasing in the year 2000 (HRT? – Women’s Health Initiative)

• Breast cancer death rates on the decline since 1989 - women under 50 have experienced the largest decrease
  • Treatment advances
  • Earlier detection (screening)
  • Increased awareness
Risk Factors

Table 1. Risk Factors for Breast Cancer

<table>
<thead>
<tr>
<th>Nonmodifiable</th>
<th>Modifiable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender</td>
<td>Not having children (slight risk increase)</td>
</tr>
<tr>
<td>Age (≥45 y)</td>
<td>Oral contraceptives (slight risk increase)</td>
</tr>
<tr>
<td>Genetic changes (mutations, BRCA)</td>
<td>Depo-Provera (slight risk increase)</td>
</tr>
<tr>
<td>Family history of breast cancer</td>
<td>Hormone therapy after menopause (risk increase after 2 y of use)</td>
</tr>
<tr>
<td>Personal history of breast cancer</td>
<td>Breastfeeding (slight risk reduction)</td>
</tr>
<tr>
<td>Race and ethnicity (White &gt; African &gt; Asian)</td>
<td>Alcohol consumption (risk increase)</td>
</tr>
<tr>
<td>Dense breast tissue</td>
<td>Obesity (risk increase)</td>
</tr>
<tr>
<td>Certain benign breast conditions*</td>
<td>Physical exercise (risk reduction)</td>
</tr>
<tr>
<td>Lobular carcinoma in situ (LCIS)</td>
<td></td>
</tr>
<tr>
<td>Menstrual periods (early menarche, late menopause)</td>
<td></td>
</tr>
<tr>
<td>Previous chest radiation</td>
<td></td>
</tr>
<tr>
<td>Diethylstibestrol exposure</td>
<td></td>
</tr>
</tbody>
</table>

*Proliferative lesions with or without atypia.
BRCA: breast cancer susceptibility gene. Source: References 1, 2.

** SMOKING

• 5-10% of Breast cancers in women are genetic (40% in men)

• Only 15% of women with Breast cancer have a family history
Computerized Risk Assessment

• Gail Model
• Claus model
Genetic Testing

• May help you determine if your cancer was due to a genetic mutation and/or help determine if you are at increased risk of cancer/second cancer

• Informed decision making concerning your and your families risk of future cancers (screening recommendations, risk reduction, treatment plans)

• Performed with a mouth wash or blood test

• BRCA 1, BRCA 2, HBOC (BRCA genes repair cell damage)
  *P53, PALB2, CHEK2, STK11, CDH1, PTEN, and more . . .
Lifetime Risk of Cancer
General population vs HBOC

- Breast cancer
- Ovarian cancer
- Prostate cancer
- Pancreas cancer
- Male breast cancer

HBOC: Hereditary Breast and Ovarian Cancer
Genetic Testing Indications

An Individual with, or a Family History of any of the following

- Breast Cancer diagnosed at age 50 or younger
- Ovarian cancer at any age
- Two primary breast cancers
- Male breast cancer
- “Triple negative” breast cancer
- Pancreatic cancer with HBOC-asso cancer (Breast, ovarian, pancreatic)
- 2 relatives with breast with breast cancer, one under age 50
- 3 relatives with breast cancer at any age
- BRCA mutation in the family
Genetic Counseling

• Hershey Medical Center
  • Dr. Maria Baker PhD
  • 1-800-233-4082
Cancer Basics

Anatomy of the Breast

Malignant versus Benign Tumors

Benign (not cancer) tumor cells grow only locally and cannot spread by invasion or metastasis.

Malignant (cancer) cells invade neighboring tissues, enter blood vessels, and metastasize to different sites.

Time

Normal, Hyperplasia, Atyplia, DCIS, Invasive Ductal
Types of Breast Cancer

[Diagram showing various types of breast cancer]

- Invasive lobular cancer (carcinoma)
- Ductal carcinoma in situ (DCIS) (non invasive cancer)
- Invasive ductal cancer (carcinoma)

[Pie chart showing percentages of invasive breast cancer]

- Invasive Ductal Carcinoma (IDC) (76%)
- ILC (7%)
- Lobulo-Ductal (7%)
- Rare Sub-Types (2.9%)
- Mucinous (2.4%)
- Tubular (1.5%)
- Medullary (1.2%)
- Papillary (1%)
### Grading vs Staging

<table>
<thead>
<tr>
<th>Total Feature Score</th>
<th>Tumor Grade</th>
<th>Appearance of Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5</td>
<td>Grade 1 Tumor</td>
<td>Well-differentiated (appear normal, growing slowly, not aggressive)</td>
</tr>
<tr>
<td>6-7</td>
<td>Grade 2 Tumor</td>
<td>Moderately-differentiated (semi-normal, growing moderately fast)</td>
</tr>
<tr>
<td>8-9</td>
<td>Grade 3 Tumor</td>
<td>Poorly-differentiated (abnormal, growing quickly, aggressive)</td>
</tr>
</tbody>
</table>
## Staging

<table>
<thead>
<tr>
<th>Stage</th>
<th>Tumor Size</th>
<th>Lymph Node Involvement</th>
<th>Metastasis (Spread)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Less than 2 cm</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>II</td>
<td>Between 2-5 cm</td>
<td>No or in same side of breast</td>
<td>No</td>
</tr>
<tr>
<td>III</td>
<td>More than 5 cm</td>
<td>Yes, on same side of breast</td>
<td>No</td>
</tr>
<tr>
<td>IV</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Stage 0
- Carcinoma in situ – Early form

Stage I
- Localized

Stage II
- Early Locally advanced

Stage III
- Late Locally Advanced

Stage IV
- Metastasized
## Staging

<table>
<thead>
<tr>
<th>Stage</th>
<th>5-year overall survival</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100%</td>
<td>In situ</td>
</tr>
<tr>
<td>I</td>
<td>100%</td>
<td>Cancer formed</td>
</tr>
<tr>
<td>II</td>
<td>93%</td>
<td>Lymph nodes</td>
</tr>
<tr>
<td>III</td>
<td>72%</td>
<td>Locally advanced</td>
</tr>
<tr>
<td>IV</td>
<td>22%</td>
<td>Metastatic</td>
</tr>
</tbody>
</table>

Screening Recommendations

### New recommendations on breast cancer screening

The American Cancer Society has updated its guidelines for healthy women with an average risk of getting breast cancer.

<table>
<thead>
<tr>
<th>Age range</th>
<th>Mammogram</th>
<th>Clinical breast exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>No</td>
<td>Every 3 years</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>40-44</td>
<td>Annual</td>
<td>Annual</td>
</tr>
<tr>
<td></td>
<td>Optional*</td>
<td>No</td>
</tr>
<tr>
<td>45-54</td>
<td>Annual</td>
<td>Annual</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>No</td>
</tr>
<tr>
<td>55+</td>
<td>Annual</td>
<td>Annual</td>
</tr>
<tr>
<td></td>
<td>Every one or two years*</td>
<td>No</td>
</tr>
</tbody>
</table>

*Based on discussion with doctor about benefits and risks of mammography.

NOTE: Screenings should continue as long as a woman has a life expectancy of 10 years and is a good candidate for breast cancer treatment.

Source: American Cancer Society
Recommendations for Breast Cancer Screening for Average-Risk Women Differ Among Guidelines

<table>
<thead>
<tr>
<th>ACS(^1)</th>
<th>USPSTF (DRAFT)(^2)</th>
<th>NCCN(^3)</th>
<th>NICE(^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Age 45-54y: recommends annual screening mammography</td>
<td>- Age 40-49y: the decision to start screening mammography should be an individual one [Grade C]</td>
<td>- Age 25-39y: recommends clinical breast examination every 1-3y</td>
<td>- Age 50-70y: invited for screening mammography every 3 years</td>
</tr>
<tr>
<td>- Age ≥55y: recommends biennial screening mammography as long as women’s overall health is good with life expectancy &gt; 10y</td>
<td>- Age 50-74y: recommends biennial screening mammography [Grade B]</td>
<td>- Age ≥75y: concludes insufficient evidence to assess benefits and harms of screening [Grade I]</td>
<td></td>
</tr>
<tr>
<td>- Clinical breast examination is not recommended</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Methods of Breast Imaging

• Mammography
• Ultrasound
• MRI – testing without contrast
• Tomosynthesis – Mammography
• 3-D Ultrasound
• Nuclear Medicine – BSGI (Setamibi) and PEM
• Elastography - Ultrasound
• Optico-acoustic – Ultrasound
• Electrical Impedance Imaging
• Thermal Imaging – Not effective 2012
Breast Screening

- Mammography
  - 30-60% reduction of breast cancer mortality (50+)

Angoff Consensus - Screening Mammography

- Cancer Detection rate: >2.5 per 1000
- Recall Rate: 5 – 12%
- PPV1: 3 – 8%
- PPV2: 20 – 40%
- Sensitivity: >75%
- Specificity: 88 – 95%
Radiation Exposure from Mammography

• New equipment is low dose radiation
• 2 view mammogram = 0.4 mSv
• Radiation from natural surroundings is 3-5 mSv (> 12 x mammogram)
• Mammogram radiation dose = 7 weeks of background radiation (10 days in Denver)
• No significant increased risk of breast cancer due to screening mammograms.
Breast Density and why it matters

Radiologists classify breast density using a 4-level density scale:
- Almost entirely fatty
- Scattered areas of fibroglandular density
- Heterogeneously dense
- Extremely dense

Breast density in the U.S. (See pie chart)
- 10% of women have almost entirely fatty breasts
- 10% have extremely dense breasts
- 80% are classified into one of two middle categories

Pie chart showing the distribution:
- Almost entirely fatty breasts: 10%
- Extremely dense breasts: 10%
- Heterogeneously dense breasts: 40%
- Scattered areas of fibroglandular density in breasts: 40%
Breast Density and why it matters

• Although the cause is uncertain, there is a higher risk of breast cancer in women with dense breasts (4 – 8 X increase from fatty to dense)

• The sensitivity and specificity of mammography decrease as breast density increases

Click here to learn more about Breast Density, Breast Cancer Risk, and the Breast Density Notification Law in North Carolina
Breast Density and why it matters

mostly fatty tissue

some dense tissue
Breast Density and why it matters
Breast Density and why it matters
INTRODUCED BY MENSCH, GREENLEAF, TEPLITZ, VULAKOVICH, KASUNIC, WASHINGTON, HUGHES, WILLIAMS, FARNESI, YUDICHAK, TARTAGLIONE, BROWNE, ERICKSON, RAFFERTY, FERLO, SOLOBAY, ALLOWAY, COSTA, BOSCOLA, BAKER, BREWSTER AND WOZNIAK, JANUARY 31, 2013

REferred TO PUBLIC HEALTH AND WELFARE, JANUARY 31, 2013
Breast Density Notification Act

“This notice contains the results of your recent mammogram, including information about breast density. If your mammogram shows that your breast tissue is dense, you should know that dense breast tissue is a common finding and is not abnormal. Statistics show many women could have dense or highly dense breasts. Dense breast tissue can make it harder to find cancer on a mammogram and may be associated with an increased risk of cancer. This information about the result of your mammogram is given to you to raise your awareness and to inform your conversations with your physician.

Together, you can decide which screening options are right for you, based on your mammogram results, individual risk factors or physical examination. A report of your results was sent to your physician.”
Supplemental Imaging

- Tomosynthesis
- Ultrasound
- MRI
Tomosynthesis

- “3D Mammography”
- Obtains slices through the breast to limit overlap of tissues
- Slight increased radiation dose (double but low)

20% 50%

50% Positive bx rate
Tomosynthesis

Digital Breast Tomosynthesis

X-ray Tube

Compression paddle

Breast

Centre of Rotation

Flat Panel Detector

3D MAMMOGRAPHY IS HERE.

Everything is sharper and clearer in 3D.
Tomosynthesis
Tomosynthesis
“Screening” Breast Ultrasound
“Screening” Breast Ultrasound
“Screening” Breast Ultrasound

- The addition of ABUS to screening mammography increases the detection rate of invasive cancer by more than 35% (similar detection rate as mammography of 3.7/1000)
- False positive call back rate is increased by up to 50%. Likewise increases false positive biopsy rate.
Breast MRI

**Current indications:**

- Screening high risk patients
- Post lumpectomy with positive margins
- Neoadjuvant chemotherapy
- Evaluate recurrence if inconclusive
- Metastatic disease of unknown primary
- Lesion characterization
- MRI guided biopsy
Breast MRI

Current indications:
- Screening high risk patients
  - Women with 20-25% or greater lifetime risk of breast cancer
  - BRCA mutation
  - Hodgkin’s disease treatment
  - Strong FH of breast or ovarian cancer
  - Not enough evidence for dense breasts or pts with h/o br ca
- Adding MRI to screening mammography is better than adding US.
• Dr. Christopher Sneider
  • Surgery
• CRMC/PSU Cancer Center
  • Dr. Irina Sachelarie
  • Dr. Julia Blum
• Tracie Osborn RN, BSN,
  • Breast Nurse Navigator (960-3254)