

Breast Imaging

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April 5, 2013

Objectives

- Breast Cancer Epidemiology
- Rationale, Recommendations, and evidence for screening
- Understanding the Mammogram report
- Management of abnormal mammograms
- Management of palpable abnormalities

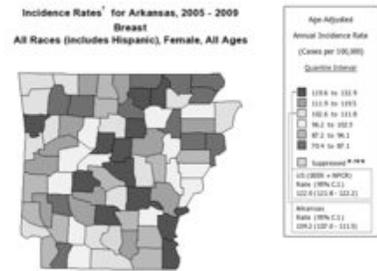
US Cancer Statistics 2013

Estimated New Cases*

		Males		Females		
Prostate	238,590	28%		Breast	232,340	29%
Lung & bronchus	118,080	14%		Lung & bronchus	110,110	14%
Colorectum	73,680	9%		Colorectum	69,140	9%
Urinary bladder	54,610	6%		Uterine corpus	49,560	6%
Melanoma of the skin	45,060	5%		Thyroid	45,310	6%
Kidney & renal pelvis	40,430	5%		Non-Hodgkin lymphoma	32,140	4%
Non-Hodgkin lymphoma	37,600	4%		Melanoma of the skin	31,630	4%
Oral cavity & pharynx	29,620	3%		Kidney & renal pelvis	24,720	3%
Leukemia	27,880	3%		Pancreas	22,480	3%
Pancreas	22,740	3%		Ovary	22,240	3%
All Sites	854,790	100%		All Sites	805,500	100%

CA CANCER J CLIN 2013;63:11-30

AR Cancer Statistics 2009



1,821 New Cases

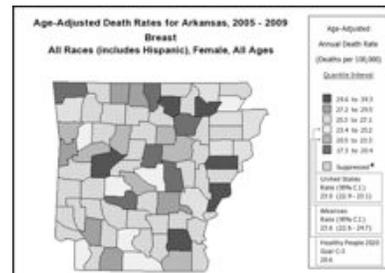
US Cancer Statistics 2013

Estimated Deaths

		Males		Females		
Lung & bronchus	87,260	26%		Lung & bronchus	72,220	26%
Prostate	29,720	10%		Breast	39,620	14%
Colorectum	26,300	9%		Colorectum	24,530	9%
Pancreas	19,480	6%		Pancreas	18,980	7%
Liver & intrahepatic bile duct	14,890	5%		Ovary	14,030	5%
Leukemia	13,660	4%		Leukemia	10,060	4%
Esophagus	12,220	4%		Non-Hodgkin lymphoma	8,430	3%
Urinary bladder	10,820	4%		Uterine corpus	8,190	3%
Non-Hodgkin lymphoma	10,590	3%		Liver & intrahepatic bile duct	6,780	2%
Kidney & renal pelvis	8,780	3%		Brain & other nervous system	6,150	2%
All Sites	306,920	100%		All Sites	273,430	100%

CA CANCER J CLIN 2013;63:11-30

AR Cancer Statistics 2009



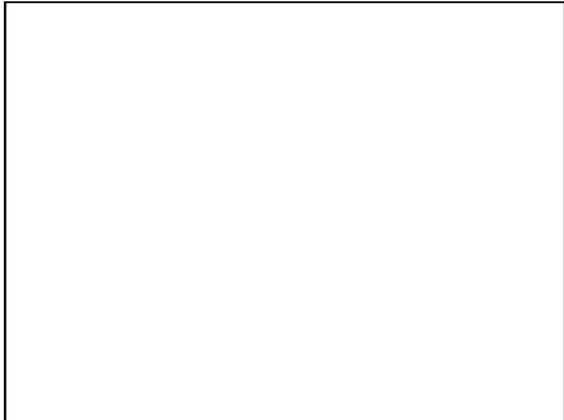
415 Deaths

TABLE 4. Probability (%) of Developing Invasive Cancers Within Selected Age Intervals by Sex, United States, 2007 to 2009*

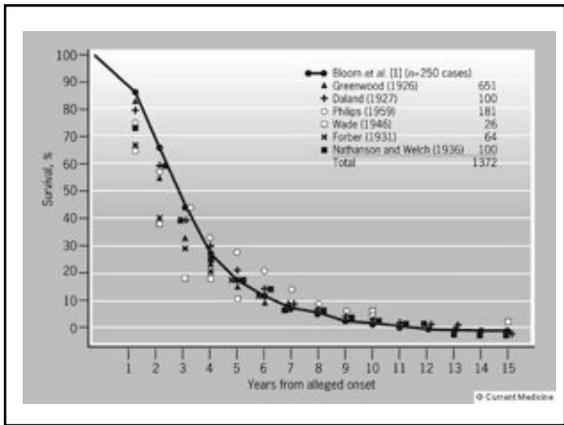
		BIRTH TO 39	40 TO 59	60 TO 69	70 AND OLDER	BIRTH TO DEATH
All sites†	Male	1.46 (1 in 68)	8.79 (1 in 11)	16.03 (1 in 6)	38.57 (1 in 3)	44.81 (1 in 2)
	Female	2.20 (1 in 45)	8.19 (1 in 11)	10.38 (1 in 10)	26.69 (1 in 4)	38.17 (1 in 3)
Urinary bladder‡	Male	0.02 (1 in 4,924)	0.22 (1 in 272)	0.50 (1 in 196)	3.69 (1 in 27)	3.81 (1 in 26)
	Female	0.01 (1 in 12,563)	0.12 (1 in 864)	0.24 (1 in 413)	0.98 (1 in 100)	1.25 (1 in 80)
Breast	Male	0.50 (1 in 202)	3.78 (1 in 26)	3.56 (1 in 28)	6.63 (1 in 15)	12.38 (1 in 8)
	Female	0.58 (1 in 172)	0.94 (1 in 106)	1.62 (1 in 71)	4.79 (1 in 21)	5.71 (1 in 18)
Colorectum	Male	0.08 (1 in 1,240)	0.75 (1 in 134)	0.98 (1 in 102)	3.82 (1 in 26)	4.78 (1 in 21)
	Female	0.10 (1 in 100)	0.55 (1 in 182)	0.25 (1 in 398)	1.26 (1 in 80)	1.59 (1 in 63)
Leukemia	Male	0.10 (1 in 100)	0.15 (1 in 653)	0.21 (1 in 481)	0.81 (1 in 123)	1.54 (1 in 65)
	Female	0.03 (1 in 3,520)	0.52 (1 in 192)	2.27 (1 in 44)	6.82 (1 in 15)	7.77 (1 in 13)
Lung & bronchus	Male	0.03 (1 in 3,520)	0.26 (1 in 385)	1.22 (1 in 82)	4.80 (1 in 21)	6.25 (1 in 16)
	Female	0.26 (1 in 391)	0.55 (1 in 181)	0.40 (1 in 248)	0.84 (1 in 120)	1.85 (1 in 54)
Melanoma of the skin§	Male	0.13 (1 in 753)	0.44 (1 in 227)	0.60 (1 in 167)	1.27 (1 in 78)	2.34 (1 in 43)
	Female	0.09 (1 in 1,111)	0.31 (1 in 322)	0.44 (1 in 229)	1.40 (1 in 72)	1.83 (1 in 55)
Prostate	Male	0.01 (1 in 2,564)	2.68 (1 in 37)	6.78 (1 in 15)	12.06 (1 in 8)	16.15 (1 in 6)
	Female	0.00 (1 in 10,000)	0.22 (1 in 455)	0.13 (1 in 769)	0.38 (1 in 263)	0.68 (1 in 147)
Uterine corpus	Male	0.00 (1 in 10,000)				
	Female	0.07 (1 in 1,348)	0.77 (1 in 129)	0.89 (1 in 112)	1.25 (1 in 80)	2.64 (1 in 38)

*For people free of cancer at beginning of age interval.
†All sites excludes basal cell and squamous cell skin cancers and in situ cancers except urinary bladder.
‡Excludes in situ cancer cases.
§Statistics for whites only.

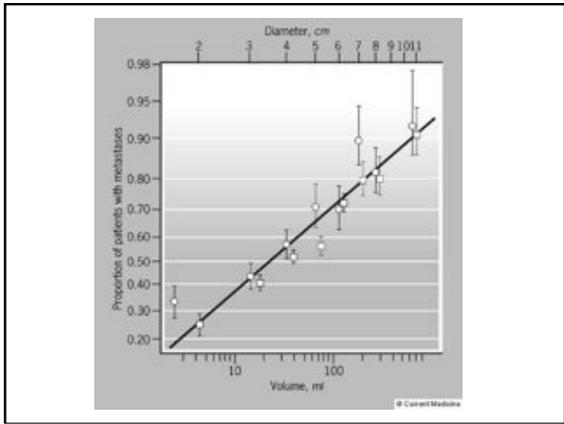
CA CANCER J CLIN 2013;63:11-30

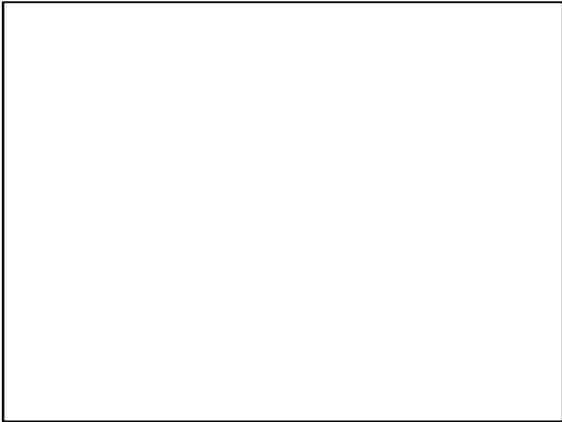
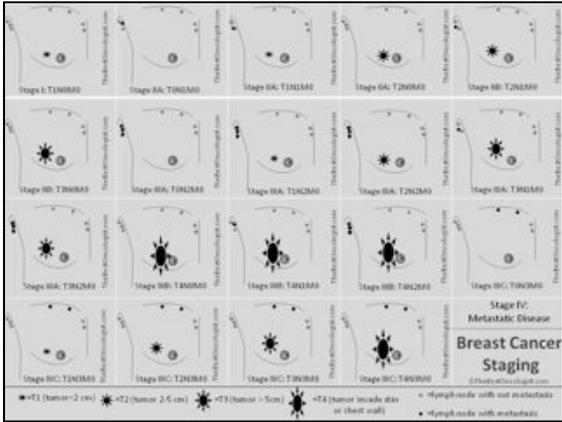


UNTREATED BREAST CANCER HAS A DISMAL PROGNOSIS

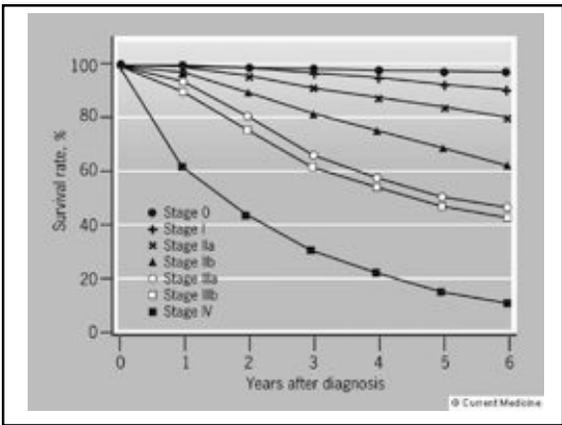


LINEAR RELATIONSHIP OF BREAST CANCER SIZE AND RISK OF LYMPH NODE METASTASIS





CORRELATION OF STAGE AND SURVIVAL



SCREENING MAMMOGRAPHY REDUCES MORTALITY FROM BREAST CANCER

- Screening Recommendations**
- Annual mammogram beginning at 40
 - Gynecologists
 - American Cancer Society
 - American Society of Breast Surgeons
 - National Comprehensive Cancer Network
 - American College of Radiology
 - Society of Breast Imaging

Screening Recommendations

- Biennial mammogram beginning at 50
– USPSTF 2009

USPSTF 2009

- Did not consider benefits of Digital technique
- 558 NNS vs. 1904 NNI
Hendrick, et al, AJR 2012; 198:723-728
- 51 LYG/1000 annual vs. 36 LYG/1000 biennial
Van Ravestey, et al, Ann Intern Med 2012; 156:609-617

Mammographic Screening

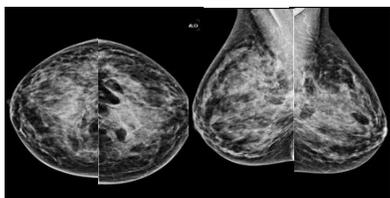
- Evaluation of a population of asymptomatic women, who have no overt sign or symptoms of breast cancer, in an effort to detect unsuspected disease earlier in its growth than without the application of the screening test
- The only screening test demonstrated to reduce mortality from breast cancer by 20 - 40%

MQSA and BI-RADS

- Mammography Quality Standards Act
– Congress enacted MQSA to ensure that all women have access to quality mammography for the detection of breast cancer in its earliest, most treatable stages.
- BIRADS
– Breast Imaging-Reporting and Data System

Screening Mammography

- Consists of two images of each breast
– Craniocaudal (CC)
– Medial-lateral-oblique (MLO)



BI-RADS

BI-RADS Code	Final Assessment	Probability of Malignancy
0	Need additional imaging	-
1	Negative exam	-
2	Benign findings	-
3	Probably Benign finding Short interval follow-up	<2%
4	Suspicious Abnormality Biopsy should be considered	2-95%
5	Highly Suggestive of malignancy	>95%
6	Known Biopsy-Proven malignancy	100%

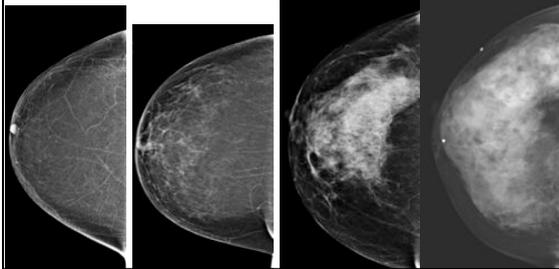
The Mammography Report

- Indication/ History
- Comparison
- Technique
- Findings
 - Breast Density
 - Masses
 - Calcifications
 - Asymmetries
 - Architectural Distortion
 - Nipple retraction/ skin thickening
- Impression
- BI-RADS code

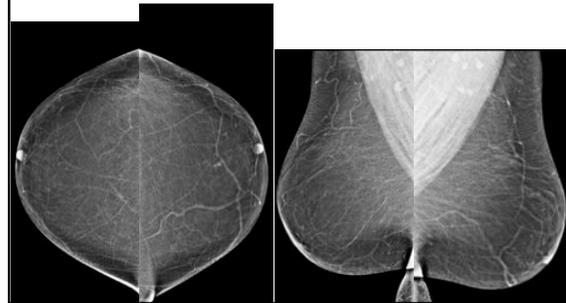
Breast Density

- Primarily composed of fat
- Scattered fibroglandular densities
- Heterogeneously dense
- Extremely dense

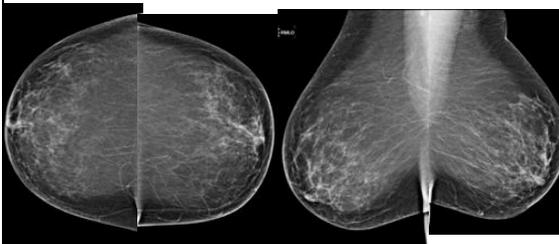
Breast Density	Percent Fibroglandular Tissue
Primarily Composed of Fat	0-25%
Scattered Fibroglandular Densities	25-50%
Heterogeneously Dense	50-75%
Extremely Dense	>75%



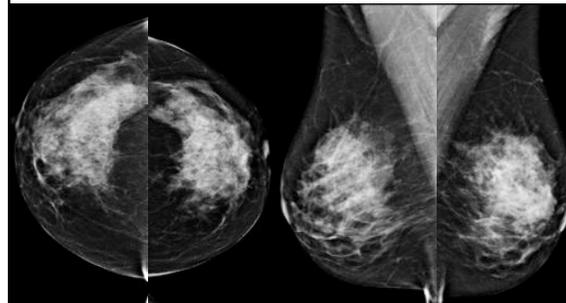
Composed Primarily of Fat

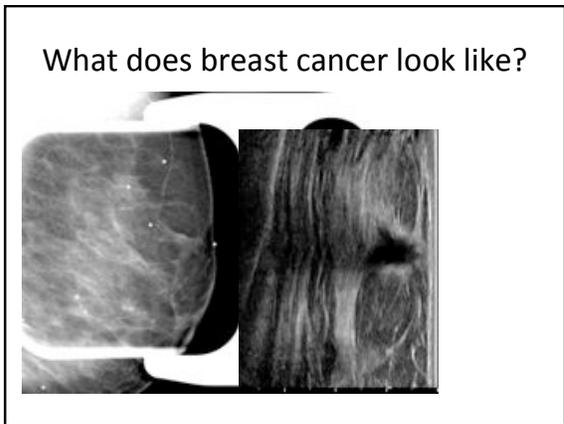
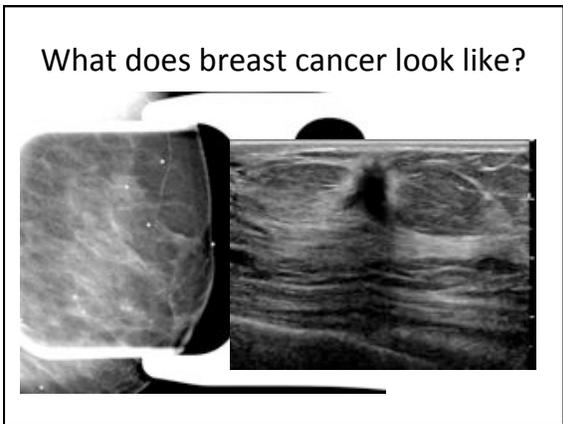
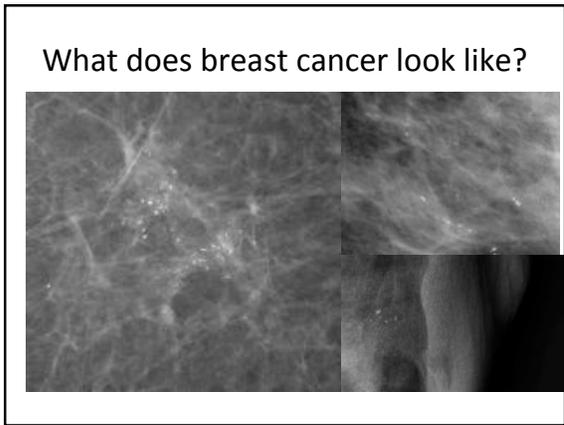
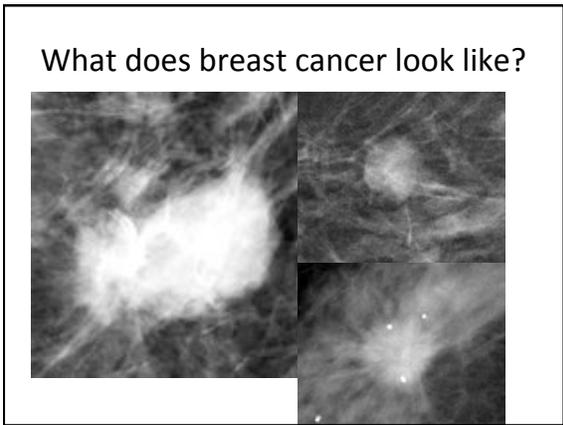
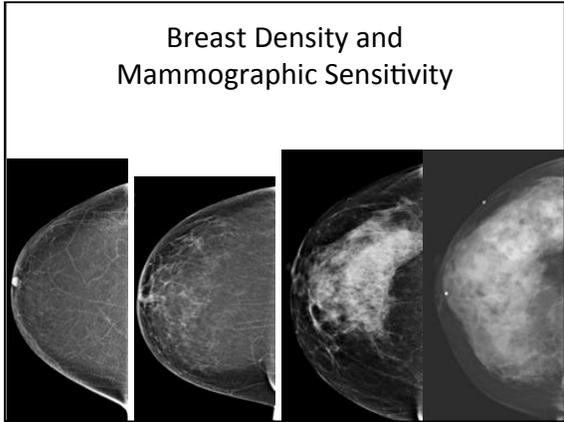
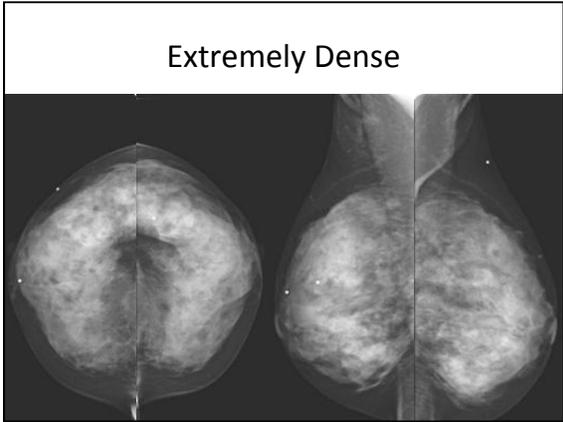


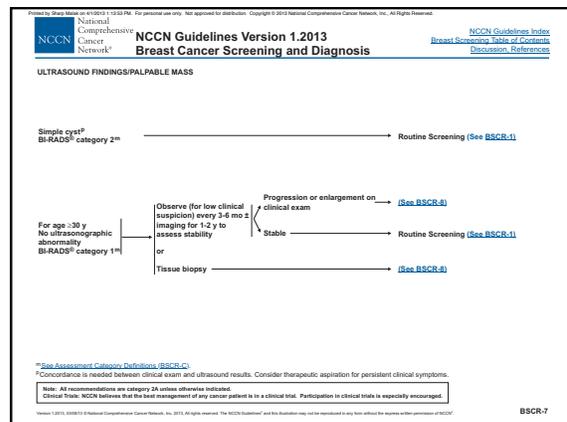
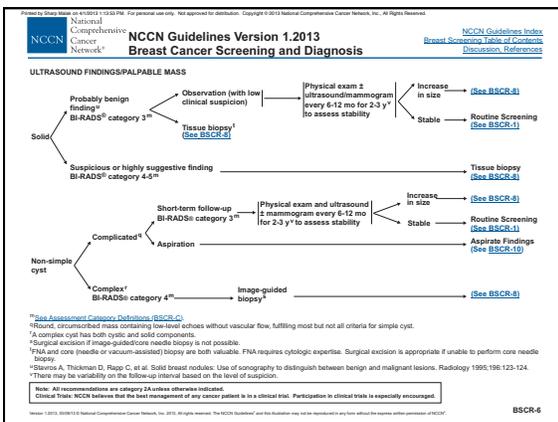
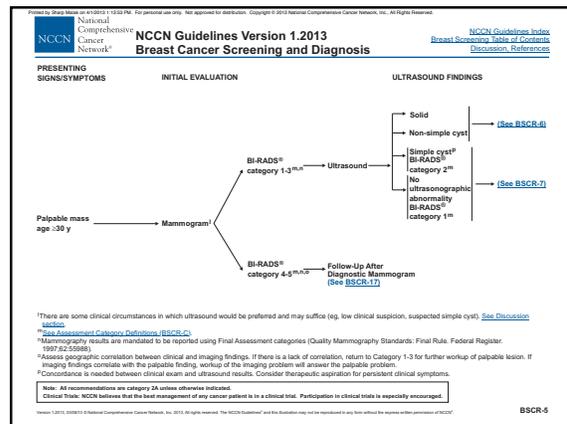
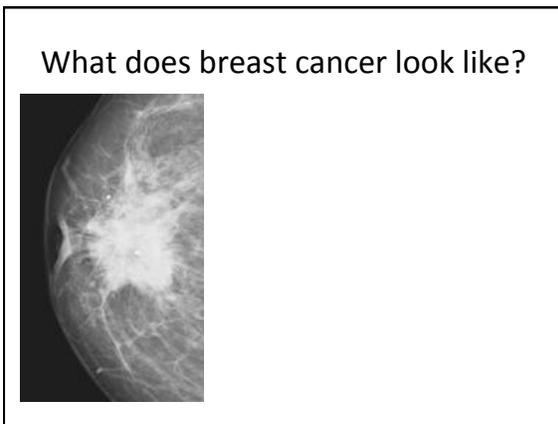
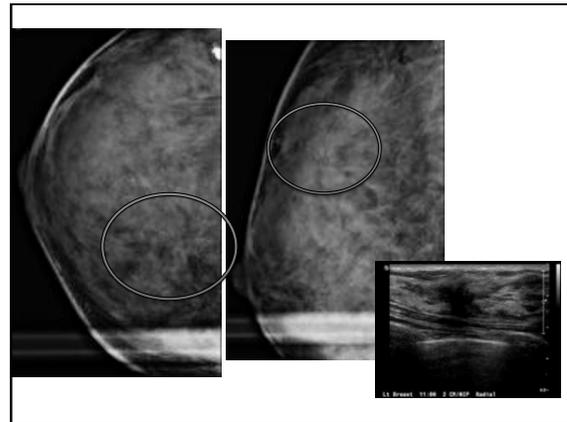
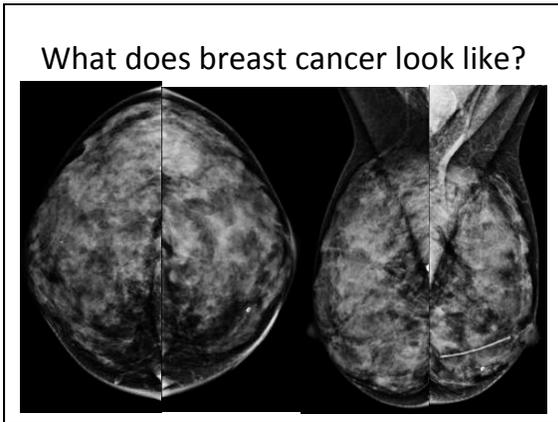
Scattered Fibroglandular Densities

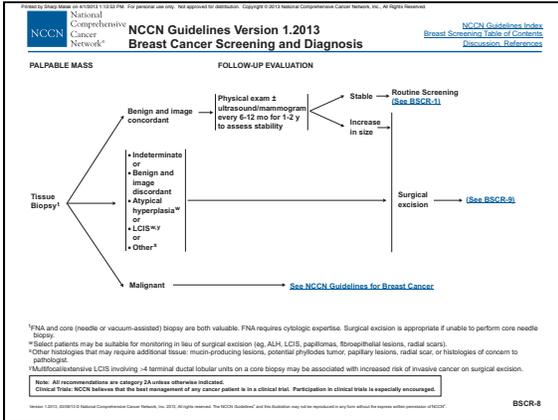


Heterogeneously Dense



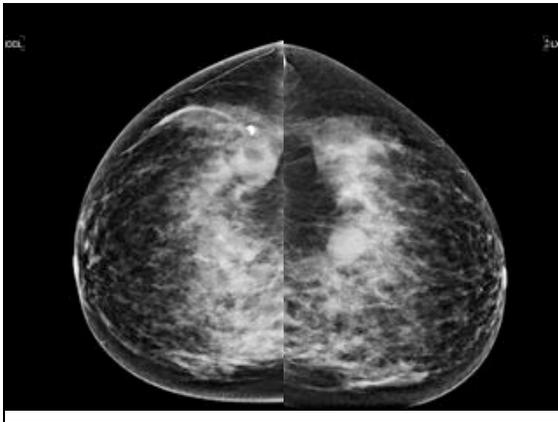
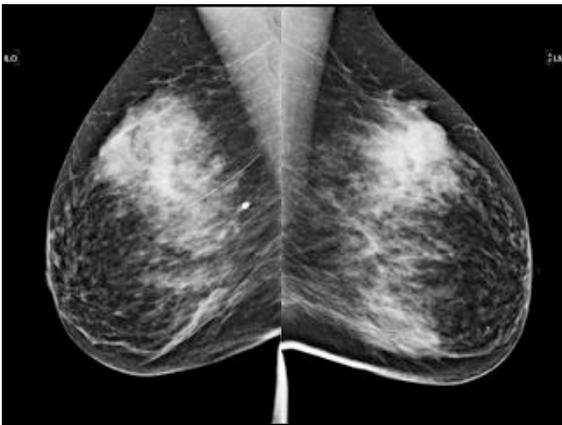
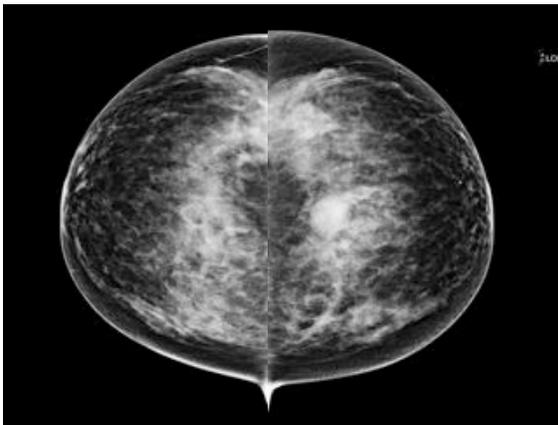




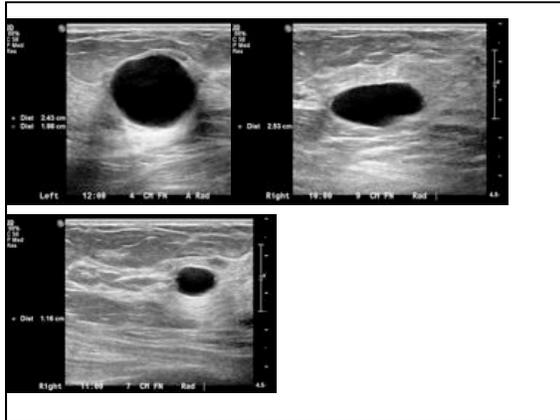


Screening Case

- 42 year old asymptomatic woman
- History of prior benign biopsy



**MASSES IN EACH BREAST
BI-RADS 0**



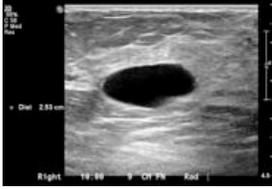
BI-RADS US Descriptors

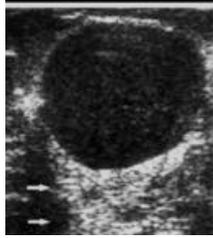
US Descriptor	Features Favoring Benign	Features Favoring Malignant	Indeterminate Features
Shape of mass	Oval	Irregular	--
		Round	
Orientation of mass	Parallel to skin	Not parallel to skin	--
Margin of mass	Circumscribed	Microlobulated	--
		Indistinct	
		Angular	
		Spiculated	
Lesion boundary	Abrupt interface	Echogenic halo	
Echo pattern	Anechoic	Complex	Isoechoic
	Hyperechoic		Hypoechoic
Posterior acoustic features	--	Shadowing	Enhancement
		Combined pattern	No posterior acoustic features

Raza, et al. Radiographics 2010; 30:1199-1213.

SIMPLE CYSTS
BIRADS - 2

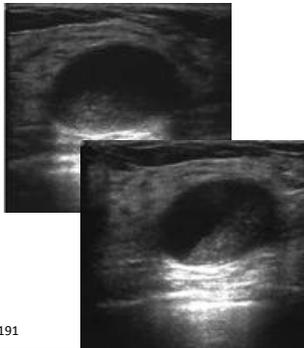
- ### Cystic Breast Masses
- Simple Cyst
 - Complicated Cyst
 - Clustered Microcysts
 - Complex Mass
 - Masses with thick wall or thick septations
 - Intracystic mass; Mixed cystic and solid masses
 - Solid masses with eccentric cystic foci

- ### Cystic Breast Masses
- Simple Cysts
 - Oval
 - Parallel orientation
 - Circumscribed margins
 - Abrupt interface
 - Anechoic
 - Acoustic enhancement
- 

- ### Cystic Breast Masses
- Complicated cyst
 -
 -
 - Low-level internal echoes
- 
- Berg et al, Radiology 2003; 227:183-191

Cystic Breast Masses

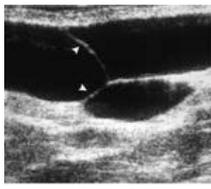
- Complicated cyst
 - Oval or round
 - Circumscribed margins
 - Abrupt interface
 - Low-level internal echoes
 - Fluid–debris level



Berg et al, Radiology 2003; 227:183-191

Cystic Breast Masses

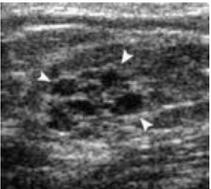
- Complicated cyst
 - Oval or round
 - Circumscribed margins
 - Abrupt interface
 - Thin (<.5mm) septations



Berg et al, Radiology 2003; 227:183-191

Cystic Breast Masses

- Clustered Microcysts
 - Clusters of 2-5 mm anechoic foci with no discrete solid component
 - Can be followed at 6,12, 24 months



Berg, WA. Radiology 2002; 224 (P):368.

Low Yield for Cyst Cytology

- 6,782 consecutive breast cyst fluid aspirates from 4,105 women
- Five intracystic papillomas detected (0.1%)
 - All were blood-stained aspirate
 - Mass on pneumocystography
 - One incidental LCIS
- Authors recommend only sending cytology for bloody aspirate

Ciatto S, et al. Acta Cytologica 1987, 31 (3): 301-304

Cystic Breast Masses

- Masses with thick wall or thick septations



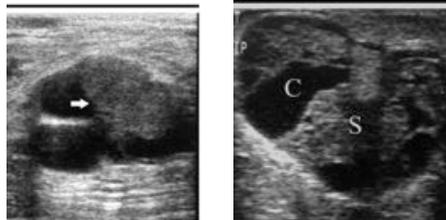
Bloody aspirate – core -> IDC Core -> IDC, G2, medullary Bloody aspirate – core -> IDC

RIGHT BREAST PHILIP INDUSTRIES

Berg et al, Radiology 2003; 227:183-191

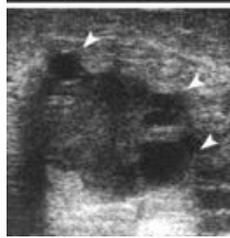
Cystic Breast Masses

- Complex Mass
 - Intracystic mass
 - Cystic and solid mass



Cystic Breast Masses

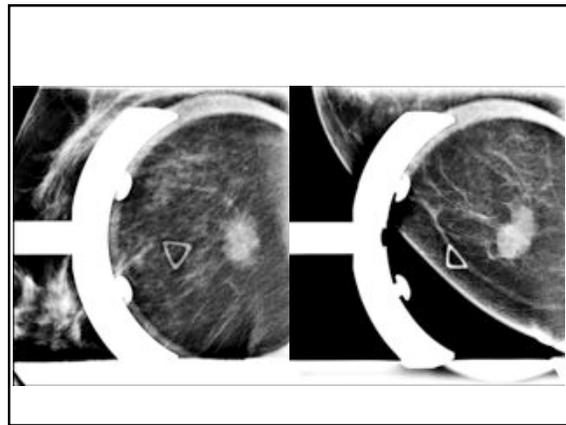
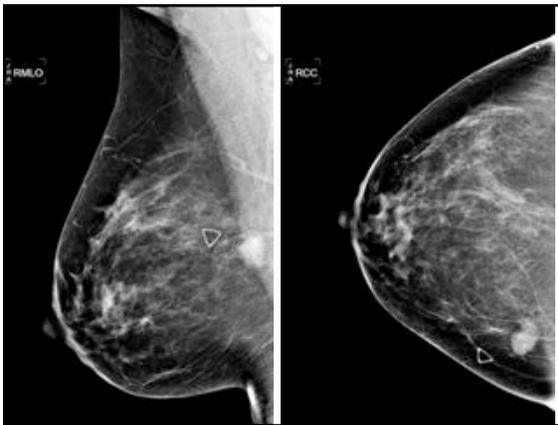
- Complex Mass
 - Solid mass with eccentric cystic spaces



Berg et al, Radiology 2003; 227:183-191

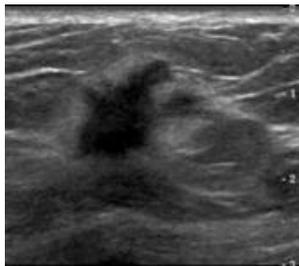
Diagnostic Case

- 34 year old palpable mass
- No family history breast cancer



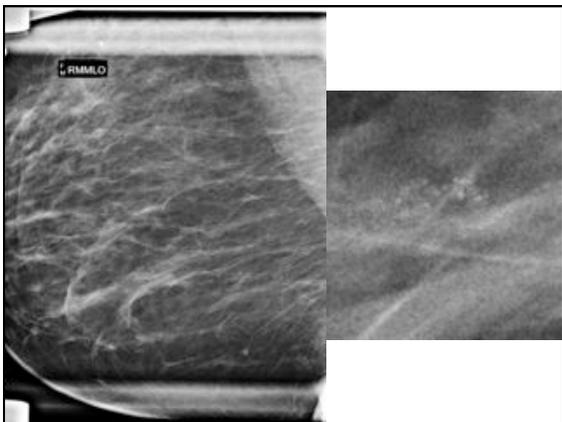
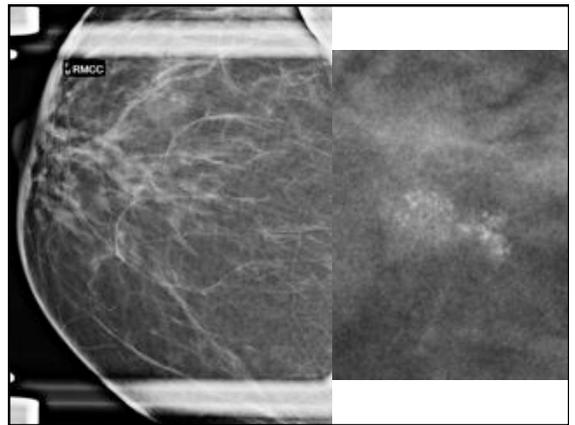
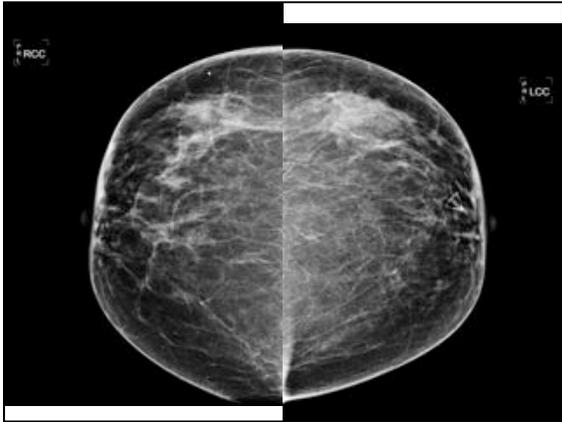
Mass

- Irregular Shape
- Not Parallel
- Angular margins
- Echogenic halo
- Hypoechoic
- Posterior acoustic shadowing

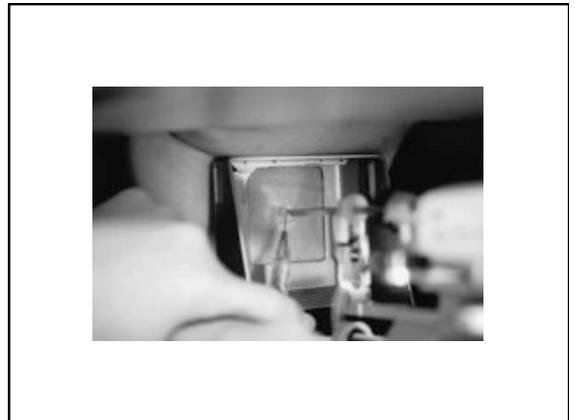
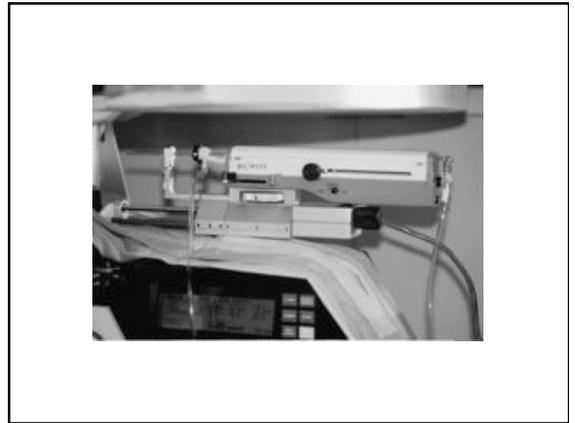
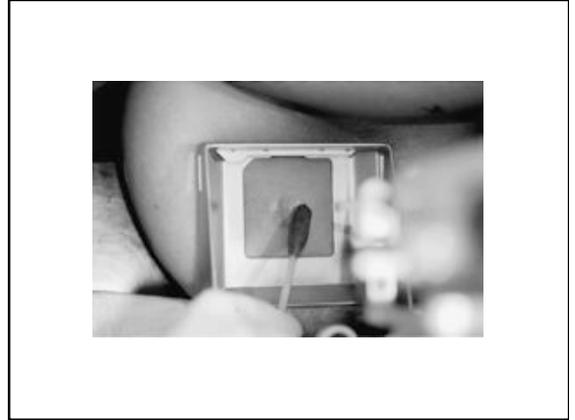


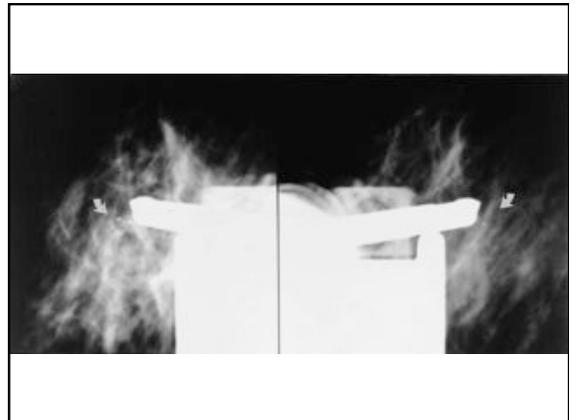
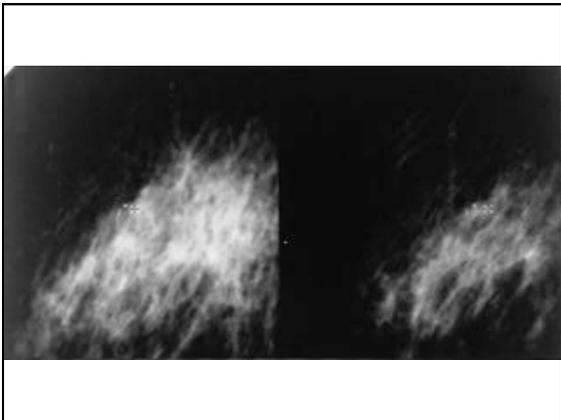
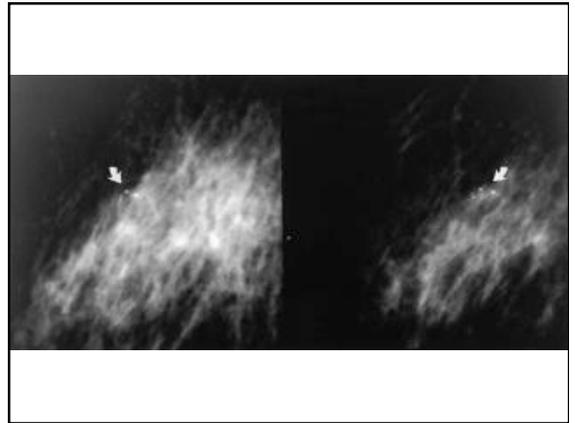
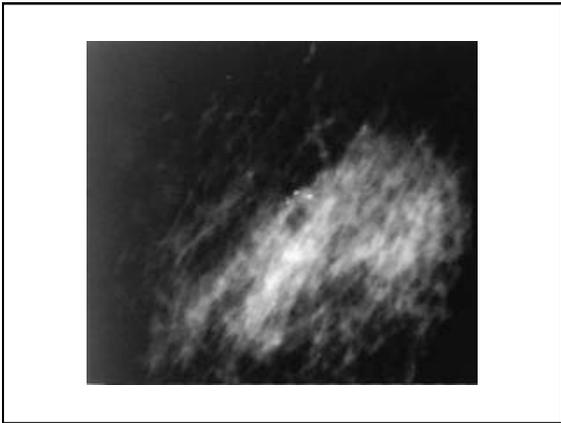
Diagnostic Case

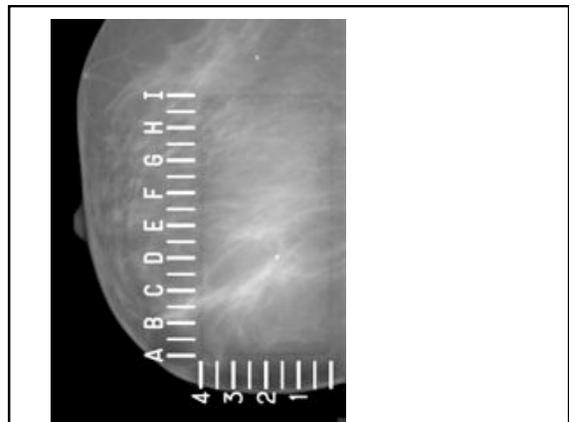
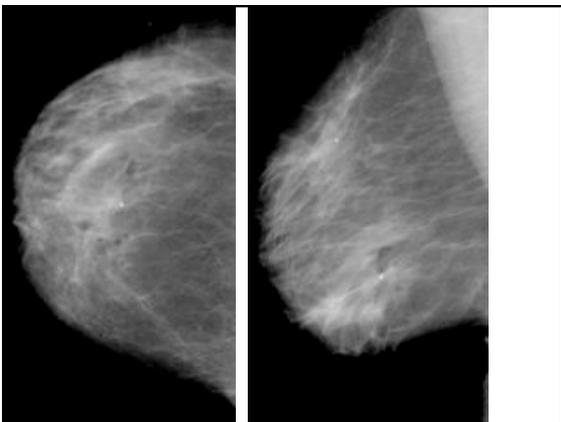
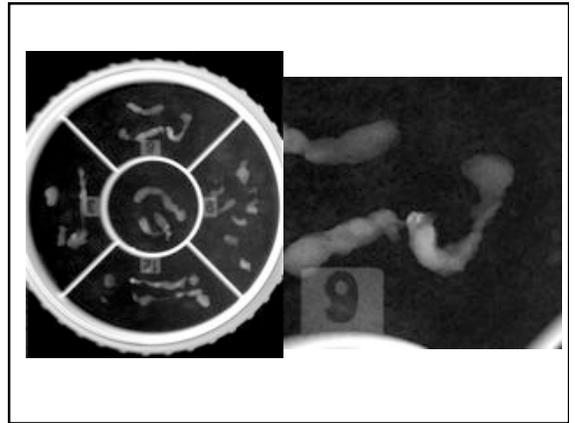
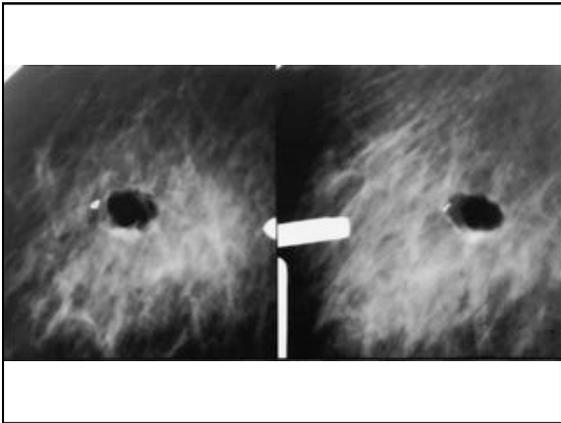
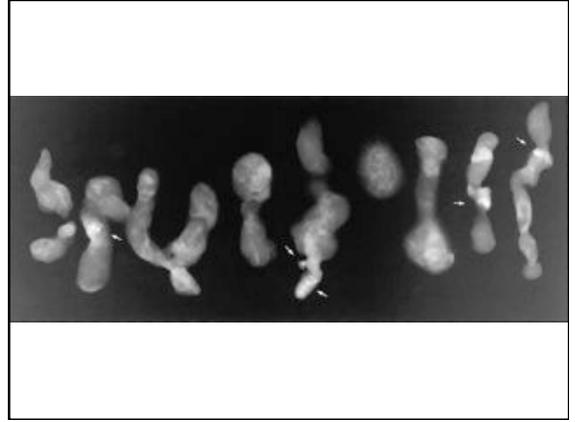
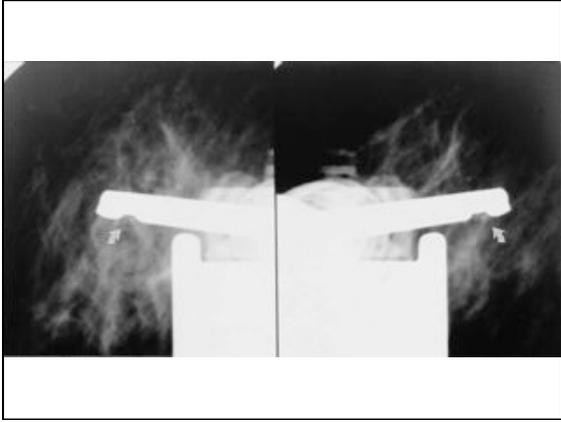
- 54 year old woman with an area of palpable concern in the left breast.

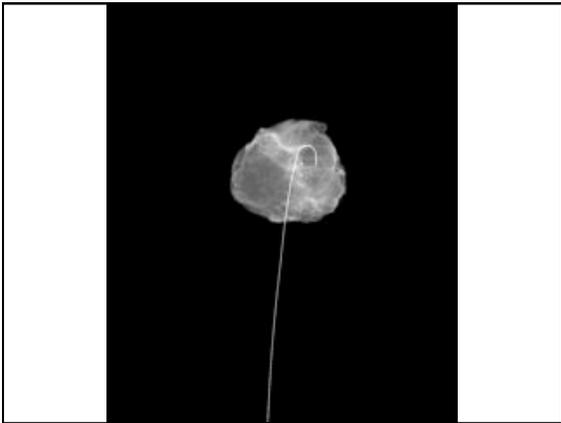
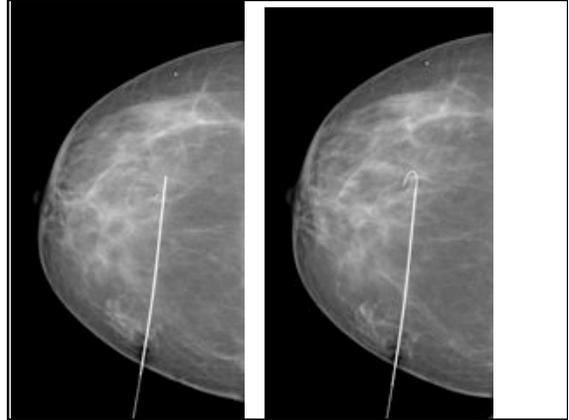
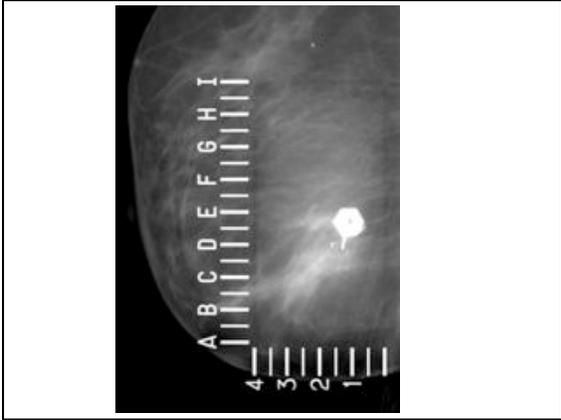


**INDETERMINATE CALCIFICATIONS
BIRADS - 4**









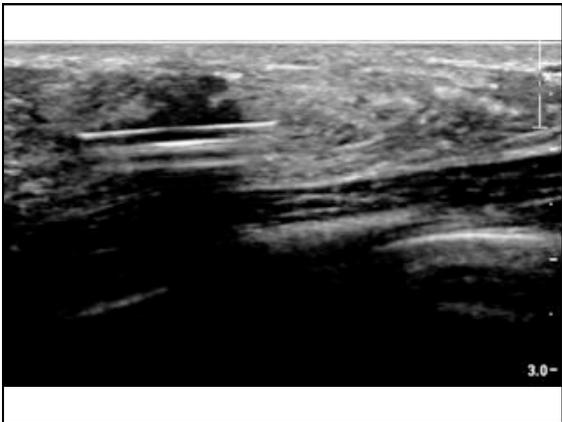
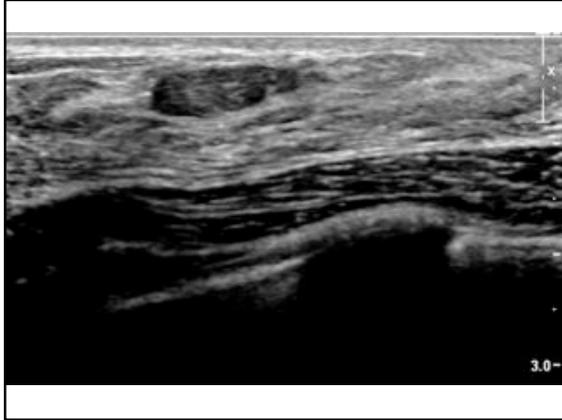
Diagnostic Case

- 25 year old patient with a palpable breast mass
- No family history of breast cancer



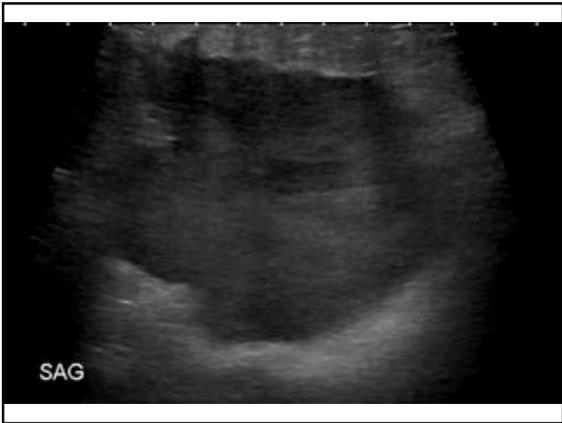
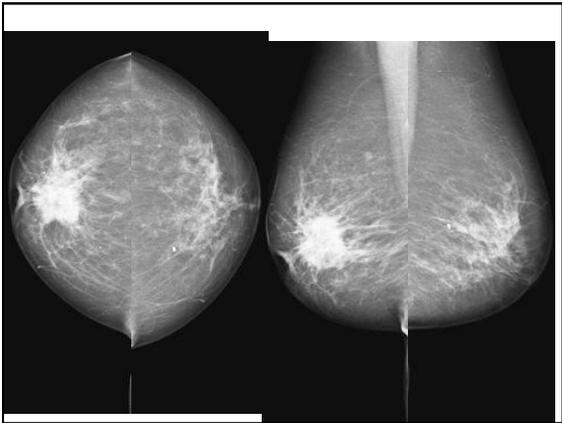
**PROBABLY BENIGN
BIRADS - 3**

PATIENT REQUESTED BIOPSY

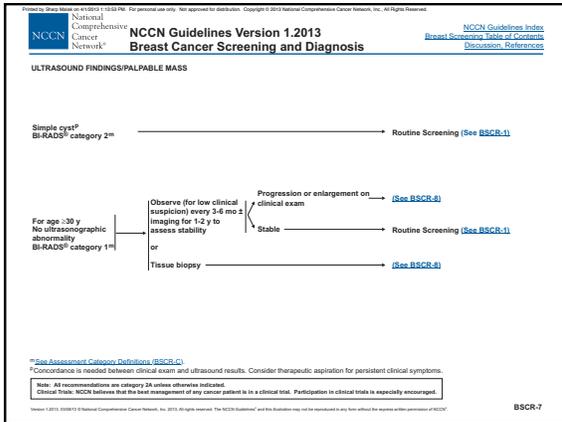
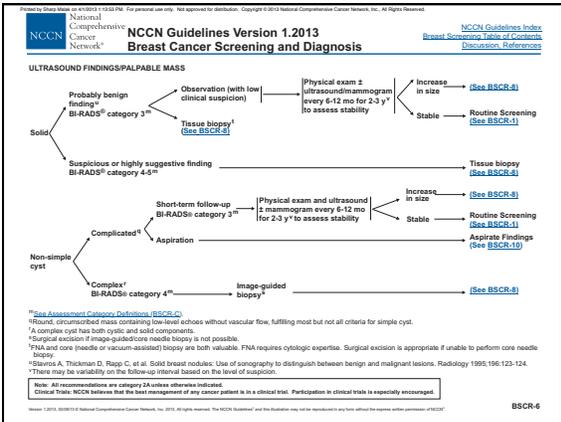
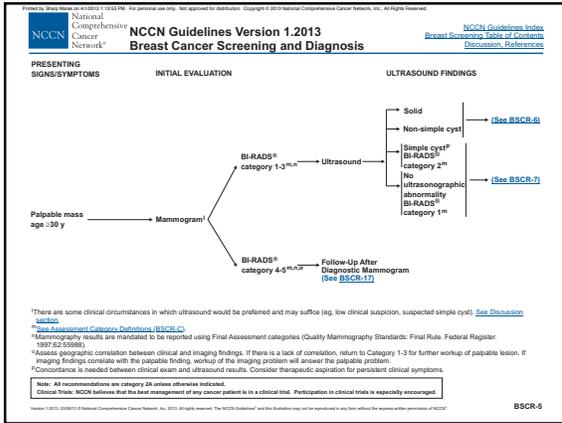
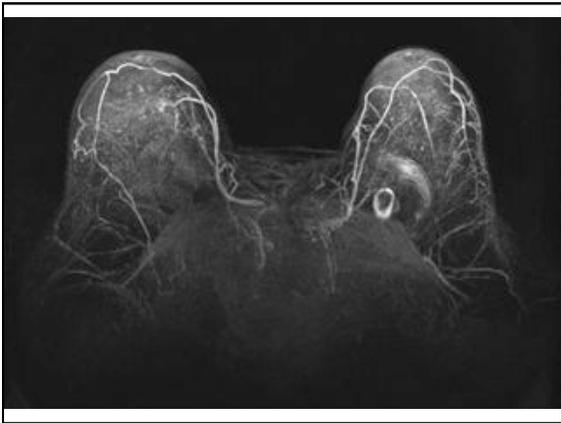
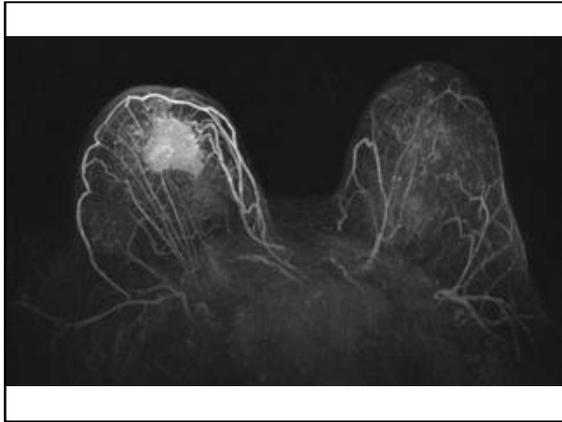


**PATHOLOGY REVEALED
FIBROADENOMA**

Diagnostic Case



**HIGHLY SUSPICIOUS
BIRADS-5**



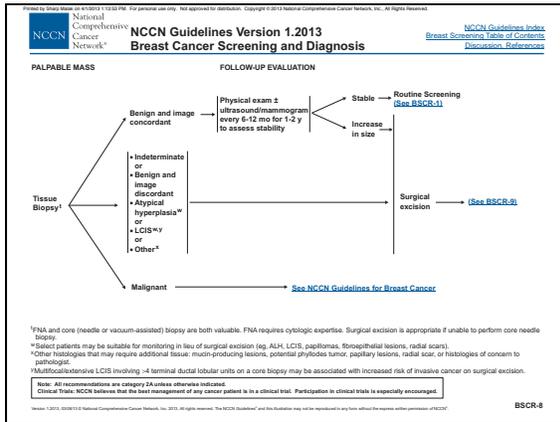


Table 10. Analysis of medical audit data: desirable goals

PPV, based on abnormal screening examination	5–10%
PPV, when biopsy (surgical, FNA, or core) recommended	25–40%
Tumors found—Stage 0 or 1	>50%
Tumors found—Minimal cancer [†]	>30%
Node positivity	<25%
Cancers found per 1,000 cases	2–10
Prevalent cancers found per 1,000 first-time examinations	6–10
Incident cancers found per 1,000 followup examinations	≤10%
Recall rate	>85%
Sensitivity (if measurable)	>90%
Specificity (if measurable)	>90%

[†]Minimal cancer is invasive cancer ≤1 cm or in situ ductal carcinoma.

Note: FNA = fine needle aspiration; PPV = positive predictive value.

