

# Digital Mammographic Imaging Screening Trial D-MIST

American College of Radiology  
Imaging Network (ACRIN)  
National Cancer Institute (NCI)

# Overview

- A Screening Trial
- Eligible Women
  - Consecutive Asymptomatic women presenting for Screening Mammography

# Methods

- All women undergo BOTH screen-film and digital mammography.
- Images read independently by two separate readers.
- Work-up occurs based on the results of both examinations.

# Primary Outcome Measures

- ROC performance
  - Area under the Curve
    - Sensitivity
    - Specificity
  - PPV
  - NPV

# Eligible Patients

- Consecutive women presenting for screening mammography at participating institutions.

# Overview

- 49,500 women to be enrolled at 28 centers
- 6 to 10 centers for each digital mammography manufacturer
  - Fischer
  - Fuji
  - General Electric
  - Trex

# Fischer Sites

- UNC (Cancer Center)
- Beth Israel Deaconess
- Washington (DC) Radiology Associates
- Memorial Sloan Kettering
- LaGrange Hospital (Chicago)
- Kansas School of Medicine

# Fuji Sites

- UNC (Ambulatory Care Center)
- U of Washington
- UC Davis
- UCLA
- Mount Sinai (NY)
- Lahey Clinic

# GE Sites

- U of Colorado
- U Mass
- Northwestern
- U of Toronto
- Penn
- Mallinckrodt
- Mt. Sinai
- Shore Memorial (NJ)
- U Cincinnati
- UT Southwestern

# Lorad Sites

- Johns Hopkins
- Columbia University
- Thomas Jefferson University
- Monmouth Hospital (NJ)
- University of Iowa
- Mass General

# Overview

- 1800+ women enrolled at each center
- 2.0 years of accrual, 1.0 years of follow-up, analysis and publication

# Excluded Patients

- Patients with dominant lump on physical examination.
- Patients with a clear or bloody nipple discharge.
- Patients with implants.
- Patients who are pregnant or believe they may be pregnant.
- Patients who cannot undergo follow-up mammography one year after study entry (not necessarily at the same institution, but, if not, must provide access to follow-up mammograms.)

# Image Acquisition

- 2 standard views of each breast and however many additional views are needed to include all breast tissue on the examination (Inners, outers, uppers, lowers) using both digital and screen-film systems.
- NO extra diagnostic views of the breast using the digital system.
- No MAGS, Focal compression views, rolled views, exaggerated views, true lateral views.

# Image Acquisition

- Same technologist will take digital and screen-film mammograms on an individual patient.
- Technologist must be eligible to take mammograms under MQSA.
- Approximately same angle and degree of compression with both systems.
- Randomized order of acquisition
- Use AEC at same dose with both systems, if available.
- Dose matching

# Image Interpretation

- Two radiologists per patient, one to interpret each examination – one for digital and one for screen-film.
- No discussion of case until both interpretations are finalized.
- No residents or fellows or students should be present until AFTER interpretations are finalized.
- Radiologist must interpret the study independently, without assistance from others.

# Image Interpretation

- Radiologists who read at each site will spend equal time reading in each condition (digital and screen-film).
- No more than 5 readers allowed at each site.
- No fellows, residents or non-staff radiologist readers.
- Interpretations entered into ACRIN web site BEFORE consultation with others.

# Work-up of Lesions

- If EITHER exam is abnormal, additional work-up should take place according to standard clinical protocols.
- Work-up findings for EITHER or BOTH examinations. Work-up even if the digital does not confirm screen-film or vice versa. All positive tests require work-up as per usual clinical practice.

# Work-up of Lesions

- Work-up will utilize usual equipment used for this purpose in the practices.
- For most cases, work-up will be screen-film mammography images plus sonography.
- May include MRI, other imaging tests.
- May progress to biopsy, as per usual clinical protocols.

# Work-up of Lesions

- Performed as per usual institutional protocols.
- Performed with as much consultation with other experts as usual at each institution.

# Scales for Interpretation of Mammograms

- Standard BIRADS scale
- Probability of malignancy
- Call back Scale

# Probability of Malignancy Scale

- 1: The finding is definitely not malignant.
- 2: The finding is almost certainly not malignant.
- 3: The finding is probably not malignant.
- 4: The finding is possibly malignant.
- 5: The finding is probably malignant.
- 6: The finding is almost certainly malignant.
- 7: The finding is definitely malignant.

# Call Back Scale

- 1) NO evidence that the patient should be called back for diagnostic work-up.
- 2) SOME evidence that the patient should be called back for diagnostic work-up.
- 3) MARGINAL but SUFFICIENT evidence that the patient should be called back for diagnostic work-up.
- 4) STRONG evidence that the patient should be called back for diagnostic work-up.
- 5) OVERWHELMING evidence that the patient should be called back for diagnostic work-up.

# Follow-up Protocol

- Patients are to inform study personnel if they undergo breast biopsy during the first year of follow-up after their entry mammogram.
- All patients will be contacted by phone and mail by local RA's at one year to ascertain breast cancer status and to schedule follow-up mammography.
- Chart reviews, tumor registry searches for those who cannot be contacted.
- Information on follow-up mammograms.
- Truth about breast cancer status determined at 9-15 months after entry mammogram.

# Quality Control Protocol

- Developed by a team of physicists headed by Martin Yaffe and Edward Hendrick
- Similar to MQSA requirements for screen-film mammography with daily, weekly, monthly and quarterly requirements.
- Central oversight.
- Acceptance Testing to determine function of machines prior to study onset.

# Cost Effectiveness Analysis

- Developed by Anna Tosteson of Dartmouth Medical School
- Phase 1 measures direct medical and human costs of a positive test.
- Phase 2 will use modeling to address long term cost-effectiveness of digital mammography.

# Patient Quality of Life Assessment

- Developed by Dennis Fryback of the University of Wisconsin
- Will measure effect of expected reduction of false positives on Patient QOL and anxiety.
- Telephone Surveys

# Pathology Confirmation

- All pathology reports will be coded by one of two expert breast pathologists.
- All pathology specimens will be re-read by one of two expert breast pathologists.
- If there is disagreement between local and first central reader, another central reading will take place.
- Truth determined by opinions of 2/3 readers.

# Secondary Aims

## Reader Studies Year 3

- To assess accuracy of softcopy vs. printed film.
- To assess effect of prevalence of positive cases on how well controlled reader studies can estimate diagnostic accuracy.
- To assess effect of breast density on diagnostic accuracy.

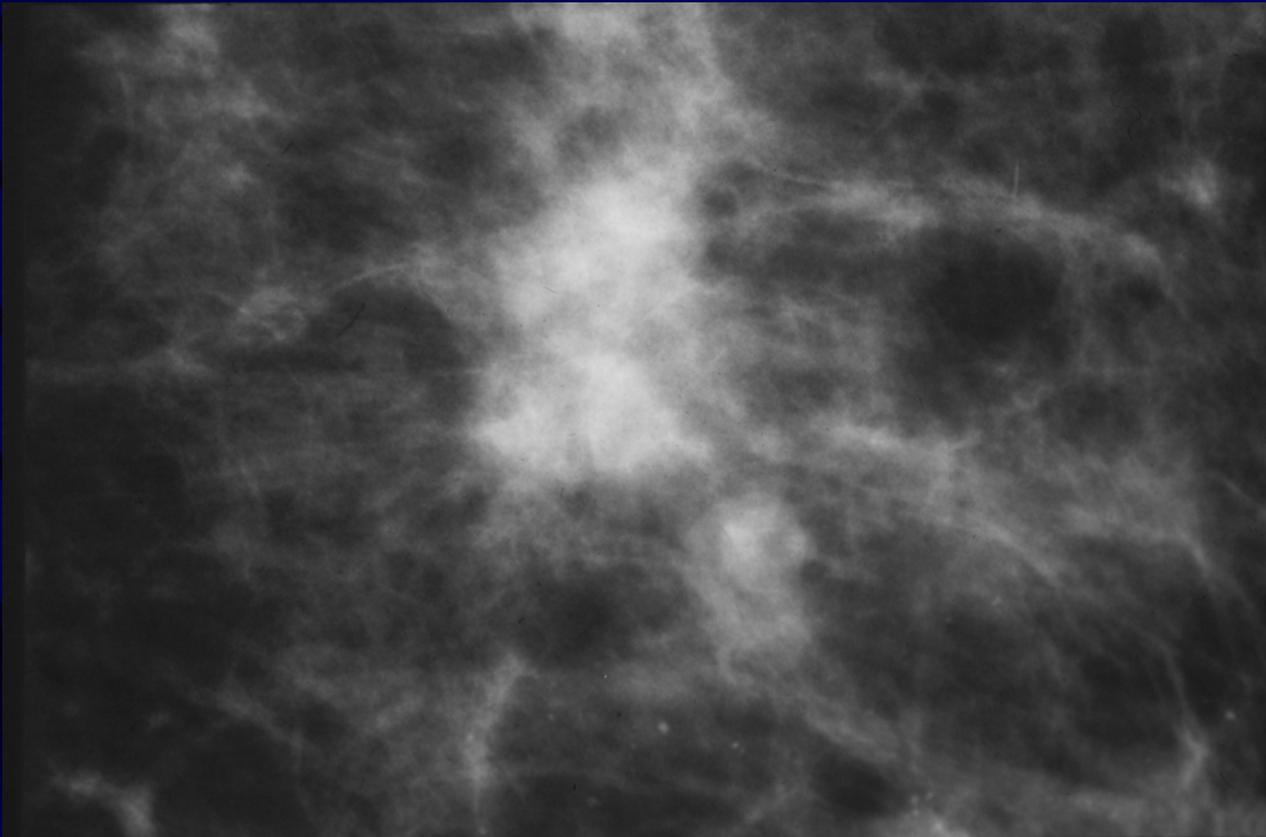
# Secondary Aims

- To assess diagnostic accuracy of each unit vs. screen-film mammography.
- To assess effect of patient characteristics such as age, lesion type, pathologic diagnosis, menopausal and hormonal status, breast density and family history on digital mammography accuracy.

# Technical Aims

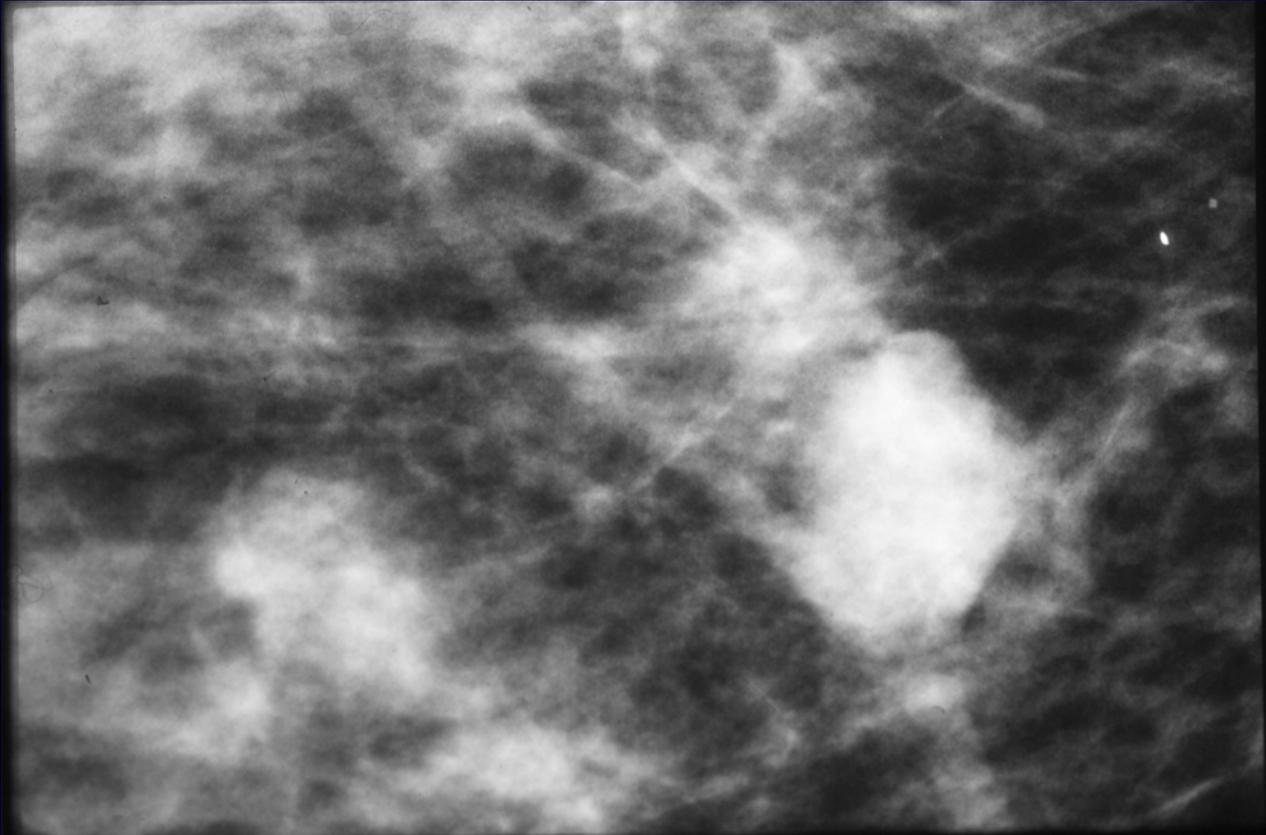
- To assess the effect of spatial and contrast resolution on diagnostic accuracy.
- To assess differences in image quality and radiation dose across participating sites.
- To assess variations in image quality, radiation dose and other QC parameters at participating sites over time.

**General Electric  
Senographe 2000D  
University of Pennsylvania**



**Invasive Ductal and Lobular Carcinoma**

**Fischer SenoScan™  
University of Toronto**



**Infiltrating Ductal Carcinoma  
Comedo and noncomedo DCIS**