

AbstractID: 4846 Title: Does Image Quality Impact Mammographic Accuracy?

Purpose: To assess the impact of resolution and noise on observer performance in detecting and classifying breast masses and microcalcifications in x-ray mammography.

Method and Materials: Simulated breast masses and microcalcifications were inserted into normal digital mammograms. A routine modified the images to simulate the effects of reduced dose. Images were viewed on three medical-grade displays: an LCD, a CRT with normal resolution, and a CRT with degraded resolution. Five experienced breast imaging radiologists scored the lesions in the image set using a custom graphic user interface based on a categorical rating paradigm. The data were analyzed to find overall accuracy and accuracy for four specific diagnostic tasks (detection of benign masses, malignant masses, and microcalcifications, and discrimination between benign and malignant masses).

Results: When using different displays but keeping noise constant at full dose, radiologists had similar overall accuracy (LCD: 0.83 ± 0.01 , CRT_{Normal}: 0.82 ± 0.01 , CRT_{Degraded}: 0.84 ± 0.01). The radiologists also had similar accuracy for each of the four clinical tasks on the three displays. Overall, no statistically significant difference in clinical accuracy was observed between the three displays ($p > 0.05$). When varying dose levels while only using the LCD display, the radiologist performance dropped somewhat (full dose: 0.83 ± 0.01 , half dose: 0.77 ± 0.02 , quarter dose: 0.61 ± 0.02). Noise had the greatest impact on the detection of microcalcifications and discrimination between benign and malignant masses.

Conclusions: This work suggests that the choice of medical display has a small impact on clinical accuracy in digital mammography. The small drops in clinical performance with increased noise suggests that dose may be somewhat decreased with limited impact on clinical utility. The categorical rating paradigm should be considered for future investigations as it allows for greater image throughput while closely modeling the clinical paradigm.