AbstractID: 7520 Title: Variation in Exposure-Dependent SNR Among Systems With Identical Digital Flat Panel Detectors

Purpose:
To establish expected performance of digital flat panel radiography systems with respect to SNR versus detector exposure under clinical conditions for thoracic imaging.

Method and Materials:
Exposures were made of a LucAl Chest phantom at 125 kVp and 180 cm SID using 16 systems (models XQ/i, XR/d, XR/dII and Definium; GE Medical Systems; Milwaukee, WI). The mAs was modified for exposures above and below the mAs delivered by AEC. Exposures measured free-in-air were corrected to the imaging plane by the inverse square law, for attenuation by the phantom, and by the Bucky factor of the grid for this phantom, geometry, and kVp. SNR was the ratio of the mean and standard deviation (SD) of an ROI automatically selected in the center of each unprocessed image. Paired data was collected for 11 systems before and after a major gain and offset calibration. SNR versus detector exposure data were interpolated using a power function to stratify the data into 0.2, 0.5, 1.0, 2.0, and 5.0 mR to the detector.

Results:
Although mean SNR changed only slightly after calibration, SD of SNR decreased markedly (41%), approaching statistical significance (p=0.061). Systems were segregated into two classes: higher (N=5) and lower (N=6) than the mean SNR. After calibration, differences were noted for both high and low groups, but were significant only for some exposure levels using a one-tailed t-test. High and low groups were significantly different (p<0.01) from each other before, but not after calibration. SNRs from 4 of 5 remaining unpaired systems conformed to the 95% confidence intervals of paired data after calibration.

Conclusions:
Exposure-dependent SNR measurements under clinical conditions provide criteria for evaluating digital flat panel radiographic systems. Calibration reduces variation among systems.