Purpose:

A clinical dosimetry protocol is developed that utilizes a dosimetric breast phantom series based on population demographics to predict the mean glandular dose (MGD) imparted to the patient during a routine screening mammogram.

Method and Materials:

A dosimetric breast phantom was developed from published data to represent the glandular (67.8%, 42.6%, 25.4%, and 16.2%) and compressed thickness (2, 4, 6, 8 cm) of a cranial-caudal view. In addition, a step phantom was developed which is composed of glandularity and thickness ranging from 0-100% glandular and thicknesses ranging from 1 to 8 cm.

A prospective study composed of 253 women from a screening mammography population with an ACR diagnosis category of 1 or 2. The cranial-caudal (CC) and medial-lateral oblique (MLO) mammograms were digitized and segmented to determine the population mammogram demographics. Glandularity was also determined from radiologist ACR density code, planimetry, tube loading, and volumetric method for comparison.

Results:

The dosimetric breast phantoms had breast thickness and glandularity comparable to published data. The CC and MLO compressed thicknesses and lateral dimensions are extracted from the population data with average compressed thicknesses of 4.46±1.17 cm and 5.21±1.39 cm, respectively. Glandularity determined from a planimetry method resulted in glandularities of 30 ± 16 % and 18 ± 18 % for CC and MLO, respectively. Glandularity based on

tube loading was developed using the BRTES-MOD phantom AEC response. The AEC response was fitted to a three dimensional plane correlating compressed breast thickness. Grandularity determined from tube loading method resulted in granularities of 61.94 ± 27.75 % and MLO was 51.19 ± 29.93 % for CC and MLO, respectively.

Conclusion:

The resultant data was used to develop a clinical protocol that correlated pixel intensity from a digitized mammogram to breast glandularity using a volumetric technique.

Conflict of Interest (only if applicable):