Purpose: To develop an objective model of the shape of the compressed breast undergoing mammographic or tomosynthesis acquisition.

Methods: Automated thresholding and edge detection was performed on 984 anonymized digital mammograms (492 craniocaudal (CC) view mammograms and 492 medial lateral oblique (MLO) view mammograms), to extract the edge of each breast. Principal Component Analysis (PCA) was performed on these edge vectors to identify a limited set of parameters and eigenvectors that . These parameters and eigenvectors comprise a model that can be used to describe the breast shapes present in acquired mammograms and to generate realistic models of breasts undergoing acquisition. Sample breast shapes were then generated from this model and evaluated. The mammograms in the database were previously acquired for a separate study and authorized for use in further research.

Results: The PCA successfully identified two principal components and their corresponding eigenvectors, forming the basis for the breast shape model. The simulated breast shapes generated from the model are reasonable approximations of clinically acquired mammograms.

Conclusions: Using PCA, we have obtained models of the compressed breast undergoing mammographic or tomosynthesis acquisition based on objective analysis of a large image database. Up to now, the breast in the CC view has been approximated as a semi-circular tube, while there has been no objectively-obtained model for the MLO view breast shape. Such models can be used for various breast imaging research applications, such as x-ray scatter estimation and correction, dosimetry estimates, and computer-aided detection and diagnosis.