AbstractID: 2790 Title: Application of Neural Network algorithm for treatment planning verification of permanent prostate implants

Purpose: The objective of this project is the evaluation of a software brachytherapy nomogram equivalent. This program was designed to predict the required air kerma strength and source count for implants based on site dimensions and volumes.

Method and Materials: The nomogram equivalent is based on a three-layer feed-forward neural network (NN). The software consists of two separate programs. One program is used for training the NN and the second program is executed for realizing the nomogram equivalent. The NN was trained using site dimensions, volumes and implanted air kerma strengths for 117 prostate cases. The network was then tested on 30 cases not included in the training set. The results of the NN calculations were also compared with the Anderson nomogram predictions.

Results: The accuracy of the NN nomogram equivalent is a function of the quality and quantity of training data, the number of iterations set to obtain the desired results, and a consistent source loading methodology. The NN predictions of the total activity and source count are in good agreement (within 11%) with the computer optimized preplanning results for all but two cases. Upon review, significant treatment volume underdosing was observed for these two cases. The Anderson nomogram prediction of the planned total activity was within 13% for all but the two outlier cases.

Conclusion: The NN based program implemented in the clinic can be an easy, fast, and accurate tool for performing independent verification of interstitial prostate implants. The NN is field-customizable, a capability not possible with a standard nomogram