A Silastic® applicator has been designed for use with ^{125}I seeds in treating recurrent nasopharynx cancer. Protruding rubber catheters, one through each nostril, allow the body of the applicator to be reproducibly lodged against the nasal septum and seeds to be afterloaded at ten potential locations. A lead foil embedded on one side protects the soft palate during treatment but is absent from an otherwise identical applicator during CT imaging for planning purposes. Because ^{125}I photons are significantly absorbed by silicone and because anatomic heterogeneities vary widely among patients, we developed a Monte Carlo algorithm for patient-specific calculation of the dose rate per unit seed strength distribution around each potential seed location. In order to speed calculation time, we eliminated resampling interaction parameters at CT voxel crossings along the photon path by treating contiguous voxels having similar densities as having the same effective atomic number. Furthermore, we adapted a kerma pathlength estimator to maximize information extraction out of each simulation without increasing the time per simulation. A typical computation time is about 30 seconds on a DEC 3000-M400 (133 MHz) workstation. The individual seed contributions are then used to select seed source strengths in planning treatment. Incorporating the heterogeneity correction, resulted in reduced target coverage and required 35%-100% higher source strengths in a test case.