

AbstractID: 13004 Title: An algorithm for automated determination of IMRT objective function parameters

**Purpose:** A new algorithm for automated determination of Objective Function Parameters (OFPs) in inverse planning is proposed.

**Method and Materials:** While in theory, optimization in inverse planning is a one-step automatic process, in practice, planner intervention is often required to carry out a multiple trial-and-error process where several parameters are sequentially varied until an acceptable compromise is achieved. We propose an algorithm for automated determination of IMRT Objective Function Parameters (OFPs). The algorithm is based on a new approach called "Adapted Dose Prescription (ADP)" wherein the dose prescriptions are automatically tailored to the sensitivity of target and OARs, which immediately results in a treatment plan meeting the clinical goals. The sensitivity of a structure is estimated by calculating the difference between the expected and obtained dose values after the end of an optimization trial. We incorporated the proposed algorithm with Fast Simulated Annealing (FSA) scheme using MATLAB software package to generate Aperture-based IMRT plans for various complex patient cases. The beam placements, aperture shaping and dose calculations were done using CMS XiO planning system in our clinic.

**Results:** So far, three patients planned using the proposed algorithm has been treated in our clinic. Our observation is that the algorithm automatically fetches a set of OFPs that immediately results in a clinically acceptable dose distribution. This approach significantly reduces the time taken for optimization by reducing the no. of optimization trials, while providing dose distribution that is comparable to that of plans obtained using KonRad inverse planning system.

**Conclusion:** The proposed algorithm facilitates the production of inverse solutions which, without the planner's intervention, precisely satisfy the specified constraints. Moreover, the results demonstrate that the proposed algorithm can be effectively used for clinical applications.

**Conflict of Interest (only if applicable):** None