AbstractID: 9808 Title: Algorithms for treatment planning with photon beams

Treatment planning in radiation therapy has evolved considerably since its inception. In the early days the patient was assumed to be homogeneously made of water and its shape was conveniently assumed to be a box. Efforts were made gradually to include the patient's external contour in the planning process and with the introduction of CT both the external and the internal anatomy could be visualized and included in the planning phase. Since that development in the 70s and early 80s we are now seeing in routine clinical practice treatment plans based on co-registered multi-modality based imaging such as: planning CT (ct simulation), MRI (preoperative and postoperative), and PET. All that, in an effort to better visualize, define, and treat the target volumes and protect the volumes at risk. Although our ability to image, reconstruct and manipulate those high resolution data sets has greatly improved with the use of fast computers, the basic principles that govern the interaction of radiation with matter have always been the same. The algorithms used to compute dose and dose distribution in the patient have not changed so much over the years. It is only in the last few years that the major manufacturers of treatment planning software are including the more accurate algorithms such as convolution, superposition and Monte Carlo in their planning systems.

In this presentation we will discuss the algorithms that have historically been used for treatment planning using photon beams with emphasis on the convolution and Monte Carlo based methodologies. Clinical examples will also be presented to demonstrate the use and outcome of dose calculations in homogeneous and heterogeneous media.

Educational Objectives:

1. To become familiar with dose calculation algorithms for photon beams
2. To understand the difference between different algorithms
3. To understand the effect of inhomogeneities in dose calculation