DOSIMETRY TREATMENT PLANNING WITH UNCERTAINTY EVALUATION.

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Abstract – Purpose/Objective: **Treatment planning results can be presented as a dosimetry report, consisting of a number of images, curves, indices, etc. and in a prescription for the delivery of the planned treatment. A complex decision process is needed in order to decide which the optimal plan is. Since this decision is based on dose computations with their associated uncertainty, a modern treatment planning process has to deal with the effects of uncertainty to achieve maximum accuracy. Several tools are presented allowing the user to work with uncertainty. Modified dose volume histograms can help evaluate competing plans so that a proper hierarchy can be established amongst different goals.**

Material/Methods: **A central estimate of a dose volume histogram curve and two limit curves define an "indifference" band in the dose volume plane. Every plan within this band can be considered not better than the initial one, because uncertainty does not allow telling them apart. If a DVH goal is met within the indifference band, the user can aim to improve a different goal.**

Results: **The methods proposed in this work are easily introduced in clinical practice. They are compatible with an iterative optimization process adding few steps to the computation.**

Conclusion: **Accuracy requirements in radiation therapy keep on increasing, while accuracy in dose measurement or modeling is only moderately improving. Although it is a minor part in the overall uncertainty budget for the treatment, computation uncertainty affects decision making. Our method help make decisions with a maximum of information. This novel method can also provide quantitative measures of the probability of achieving the goals.**