

**AbstractID: 7719 Title: Expected clinical impact of the differences between planned and delivered IMRT dose distributions**

**Purpose:** Due to the highly conformal distributions that can be obtained with intensity modulated radiation therapy (IMRT), any discrepancy between the intended and delivered distributions would likely affect the clinical outcome. Consequently, there is a need for a measure that would quantify those differences in terms of a change in the expected clinical outcome.

**Material and Methods:** To evaluate such a measure, the case of a cervix cancer was used where the bladder and rectum, are proximal and partially overlapping with the internal target volume. A solid phantom simulating the pelvic anatomy was fabricated and a treatment plan was developed to deliver the prescribed dose to the phantom. The phantom was then irradiated with films positioned in several transverse planes. The racetrack microtron at 50MV was used in the treatment planning and delivery processes. The dose distribution delivered was analyzed based on the film measurements and compared against the treatment plan. The differences in the measurements were evaluated using both physical and biological criteria.

**Results:** For the computerized treatment plan, the maximum value of  $P_+$  was 84.1%, for a mean dose to the ITV of  $\bar{D} = 93.3 \text{ Gy}$ , associated relative standard deviation  $\sigma_D / \bar{D} = 16.8\%$  and biologically effective uniform dose,  $\bar{\bar{D}}_{ITV}$  of 89.2 Gy. The delivered dose distribution from all the beams produced a  $P_+$  value of 77.0% for  $\bar{D}_{ITV} = 93.2 \text{ Gy}$ ,  $\sigma_D / \bar{D} = 19.0\%$  and  $\bar{\bar{D}}_{ITV}$  of 83.5 Gy.

**Discussion and Conclusions:** Whereas the physical comparison of dose distributions can assess the geometric accuracy of delivery, it does not reflect the clinical impact of any measured dose discrepancies. With highly conformal IMRT, the accuracy of the patient setup and treatment delivery, are critical for the success of the treatment. A method is proposed to evaluate the precision of the delivered plan based on changes in complication and control rates as they relate to uncertainties in dose delivery.