Abstract ID: 15836  Title: Clinical implementation of an automated segmented MLC field approach to improve safety of radiation treatment delivery: eliminating wedges, external shields and physical junction shifts.

Purpose: As part of routine quality improvement, departmental radiation therapy techniques were reviewed, and technical and operational modifications identified to enhance radiation delivery safety. Our aim was to standardize planning for conventional techniques that exhibit higher potential for delivery errors via automation without compromising plan quality. This was achieved through the use of segmented intensity modulated radiotherapy (IMRT) fields.

Methods: A segmented IMRT solution was developed to simulate common fields requiring: a) wedge-based modulation (eg breast, rectum), b) shielding of anatomical regions (eg midline blocks, island shields) and c) junction shifts during treatment. For cases requiring more intricate beam modulation than what can be provided by a wedge-like field, a simple inverse-planned IMRT optimization was devised. Our approach does not depend on anatomical contours, and uses standard 3D conformal beam geometries for delivery and to define planning volumes. All planning strategies were automated using Pinnacle3 scripting to increase planning efficiency and consistency.

Results: Compared to standard techniques using wedges, physical blocks, and junction shifts, the developed IMRT protocols resulted in comparable dose distributions. The implementation of scripts in Pinnacle allowed us to improve quality control, as well as planning and delivery efficiency. Delivery safety improvements were also realized. Physical junction shifts can be replaced by intra-fraction junction feathering (whereby multiple junction shifts are nested within control points, delivered daily) to reduce the dosimetric impact of field edge misalignments and simplify delivery. Regarding physical beam modifiers, the potential for accidents involving dropped devices or errors due to device omission or misalignment is virtually eliminated.

Conclusion: Radiation treatment plans that require wedges, physical blocks and junction shifts can be dosimetrically reproduced using simple segmented IMRT fields. Implementation of an MLC-based delivery offers important benefits in both workflow efficiency and patient safety.