Purpose: Intensity Modulated Neutron Radiotherapy (IMNRT) has been commissioned for clinical use. The number of allowable segments in IMNRT plans is limited by MLC speed. Quality and deliverability of static IMNRT treatment plans using the TG-119 test suite were evaluated to establish guidelines for the number of segments per plan.

Methods: Treatment plans were created and optimized to specified constraints for all cases in the TG-119 test suite using the Varian Eclipse TPS. A 4MV photon beam with similar penetration characteristics as the fast neutron beam was used as a surrogate for this optimization. Final dose calculations were performed using an in-house TPS commissioned for neutron dose calculations. Following optimization, MLC segments were created for three ranges of total plan complexity - very limited (15-23 segments), limited (24-31 segments), and unlimited. Calculated DVHs were then compared for compliance with TG-119 dose constraints. The estimated time of delivery for plans in each range was calculated based on known delivery parameters.

Results: The prostate case passes all constraints for each complexity level. All other plans fail to meet at least one constraint for one or more of the complexity levels. For all cases combined, the very limited, limited, and unlimited complexity levels meet 16, 17, and 19 of 23 total dose constraints, respectively. The mean estimated delivery time for the very limited, limited, and unlimited plans is 34 minutes (range: 27-39), 40 minutes (range: 34-45), and 68 minutes (range: 53-81) respectively, neglecting any delay due to therapists entering the treatment room.

Conclusion: IMNRT plan quality is limited by current MLC capabilities. IMNRT plans should be limited to 25 segments to ensure a reasonable treatment time of 45 minutes. Even with this small number of segments, we were able to meet most dose constraints set forth in TG-119.