The Impact of Plan Feasibility Predictions On VMAT Treatment Planning

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INTRODUCTION

The latest version of Pinnacle (Pinnacle 16.4.0) comes with a complete integration of PlanIQ Feasibility from Sun Nuclear. PlanIQ Feasibility aims to improve IMRT plan quality by providing clinically achievable constraints for optimization. This study evaluates the dosimetric differences of implementing PlanIQ Feasibility in conjunction with Pinnacle Evolution's Personalized Planning and aims to demonstrate the significance of implementing this feature.

AIM

To further explore the clinical benefits of implementing a plan feasibility check using PlanIQ with Pinnacle 16.4.0.

METHOD

To observe the impact of Plan Feasibility, two plans were created for each patient: one with the use of PlanIQ and one without. Each planner was assigned to a specific treatment site (H&N, Pelvis, and Brain) and was allotted an hour to develop each plan; so far 15 sets of plans have been completed. The patients were anonymized and given to the planners in random order to avoid any bias from their experience creating the corresponding plan within the set. After the plans were completed, the quality of each plan was evaluated.

RESULTS

T-tests were performed to determine whether there was a significant difference between the minimum, maximum, and mean doses to the structures of each site when using Feasibility with Personalized Planning. The structures were categorized as either targets or organs at risk (OARs). The results of the T-tests showed that there was a significant difference in the mean dose to the OARs in both the H&N and pelvis sites (p=0.024 and p=4.24E-06). The results also indicated that there was a significant difference in the max dose to the OARs in both the H&N and pelvis sites (p=0.010 and p=1.46E-04). When observing the targets of each site, there was a significant difference between the minimum and mean doses to the structures in only the H&N treatments (p=0.006 and p=3.40E-05).

Table 1. p-value results for T-test comparing OARs with Rx Feasibility and without.

STRUCTURES	MEAN	MAX
H&N	0.024	0.009
PELVIS	4.24E-06	1.46E-04
BRAIN	0.169	0.272

Table 2. p-value results for T-test comparing targets with Rx Feasibility and without.

TARGETS	MEAN	MAX	MIN
H&N	0.006	0.400	3.4E-05
PELVIS	0.460	0.400	0.136
BRAIN	0.280	0.112	0.320

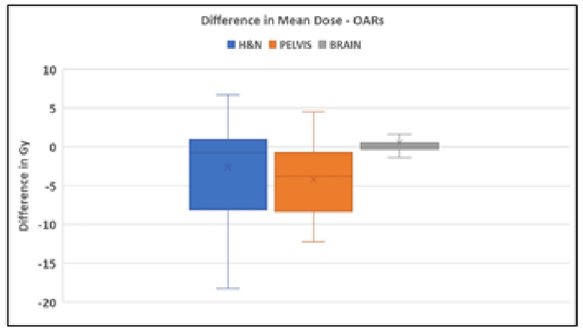

Figure 1. Difference in mean doses for OARs by site.

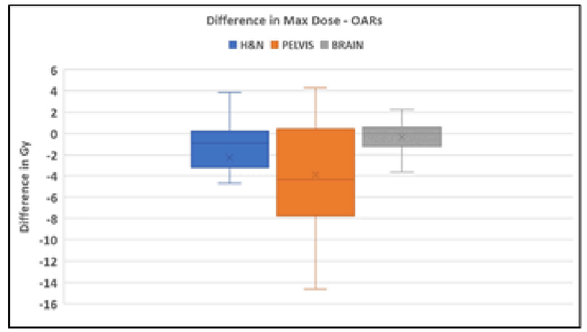

Figure 2. Difference in max doses for OARs by site.

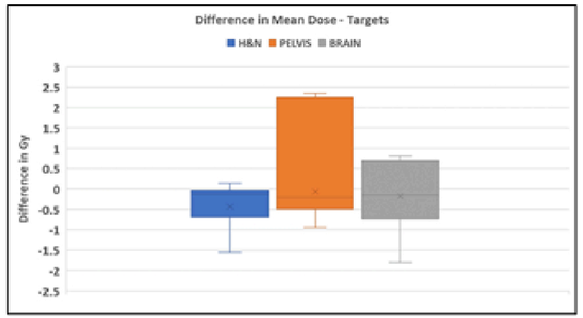

Figure 3. Difference in mean doses for targets by site.

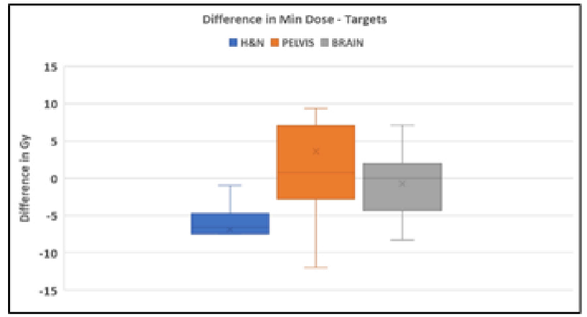

Figure 4. Difference in min doses for targets by site.

Using PlanIQ with Pinnacle Evolution, mean doses to OARs included in both H&N and pelvis treatment plans were significantly lower when using Rx Feasibility (Figure 1). Additionally, the maximum doses to OARs included in both H&N and pelvis treatment plans were significantly lower when using Rx Feasibility (Figure 2). When analyzing target structures, there was a significant difference in the mean and minimum doses for H&N patients (Figures 3 and 4).

CONCLUSIONS

The use of Feasibility during the treatment planning process can be a promising technique for reducing the mean and maximum dose to OARs while maintaining target coverage.

ACKNOWLEDGEMENTS

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