



## Introduction

Treatment planning in radiation oncology is one of the most critical components in the field of radiation treatment. Medical Dosimetrists work with different treatment planning tools such as 2D, 3D, IMRT, and VMAT to acquire desired dose results to the target area. The most current tool is Auto-planning. It is designed to create a clinically acceptable plan by providing the plan optimization parameters and in real time, create and adjust the objectives to the Treatment Planning System. The purpose of this study is to investigate whether the Auto-planning tool can create a comparable plan to an already approved clinical VMAT plan.

## Methods

Thirty patients, six from each of the following five treatment sites: Prostate, Head and Neck, Abdomen, Brain and Lung were optimized once and with the same parameters as the approved plan. The same target volumes that were defined by the physician on the already approved plan were used. Target goals and Organs at Risk constraints were inputted into the Auto-planning tool based off physician treatment “planning orders” as utilized by MD Anderson Cancer Center radiation oncologists.

## Results

The following tables and figures compare the differences for Organs at Risk (OARs), Percent Coverage, and Monitor Units between approved plans and Auto-Plan .

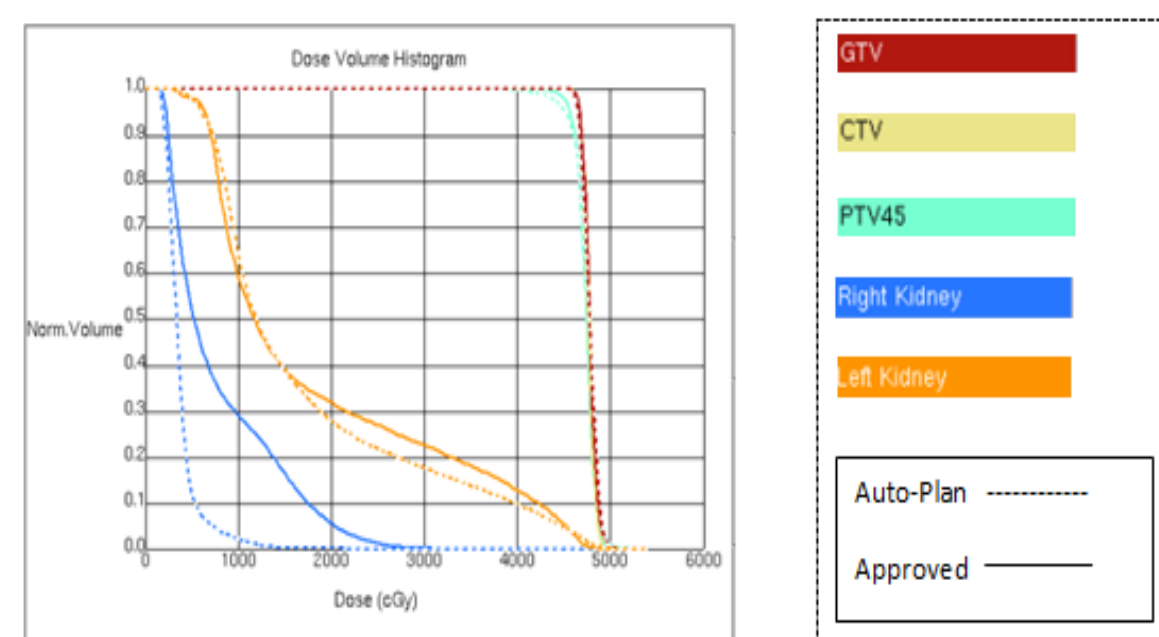


Fig.1 Dose Volume Histogram for abdomen case showing better kidney sparing by Auto-Plan as opposed to the Approved plan

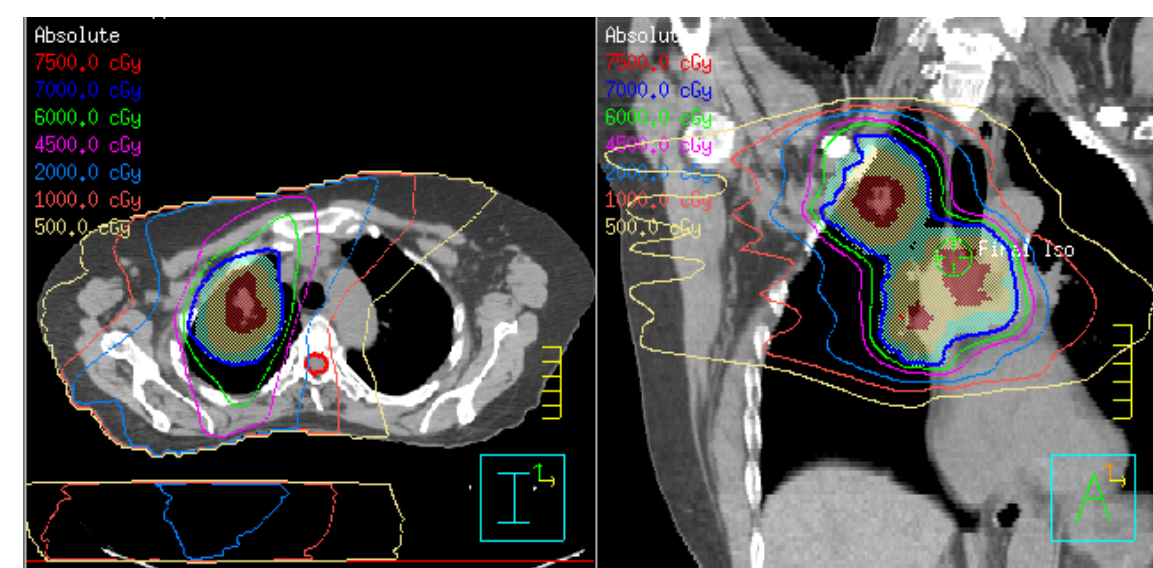


Fig. 2 Comparison of coverage for approved VMAT plan( top right and left) with PTV at 95 % and Auto-Plan (bottom right and left) with 85% in axial and coronal views.

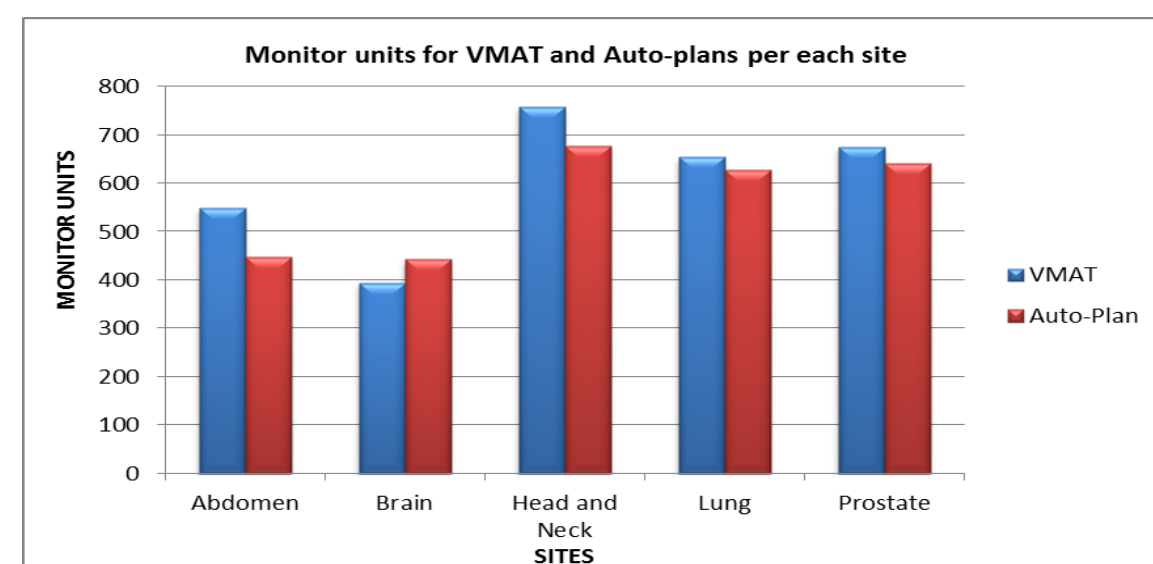


Fig. 3. Comparison of monitor units between approved plans and Auto-plans .

Critical Structures	Approved	Auto-Plan	%Difference
Rectum	V80=1.1%	V80=0.4%	63.6%
	V70=9.3%	V70=9.1%	2.2%
	V60=14.1%	V60=14.3%	1.4%
	V40=22.8%	V40=23.4%	2.6%
	V30=30.9%	V30=33.3%	7.2%
Femoral Heads	V50=0%	V50=0%	0%
	V45=0%	V45=0%	0%
Bladder	V70=5.2%	V70=5.1%	1.9%
PTV	98.7%	97.2%	1.5%

Table 1.Average OAR and Target coverage for Prostate treatment

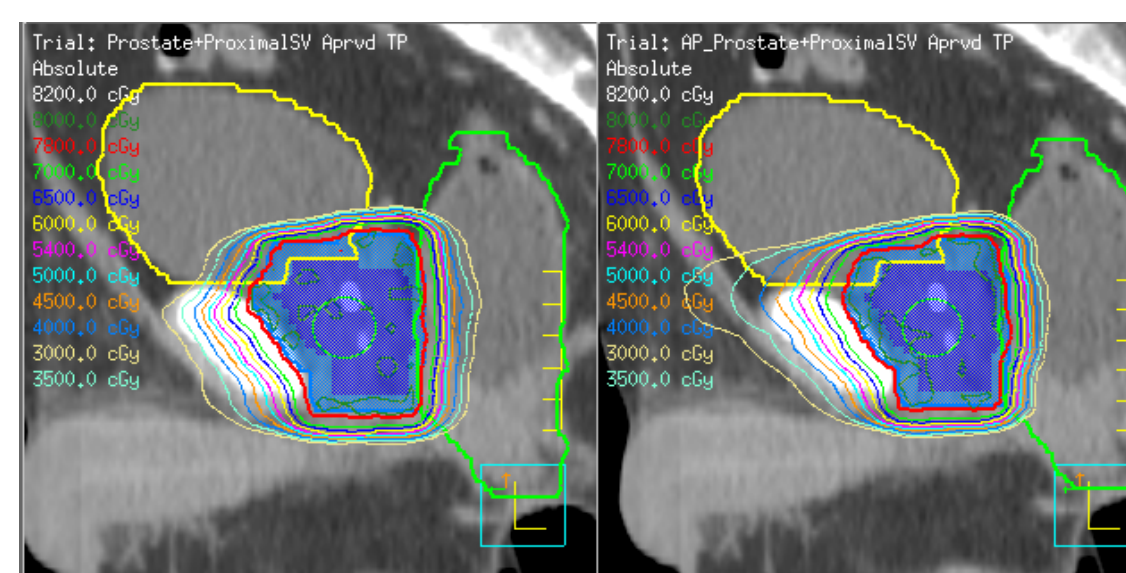


Fig. 5 No noticeable difference is seen between isodose lines of two trials

Critical Structures	Approved	Auto-Plan	%Difference
Brainstem	V30 = 20%	V30 = 26%	26%
	V55 = 0.3cc	V55 = 0.2cc	-40%
	V60 = 0cc	V60 = 0.03cc	200%
Brain	V30 = 38%	V30 = 41%	7.6%
Chiasm	Max: 3624cGy	Max: 3742cGy	2.7%
Lt Cochlea	Max: 1439cGy	Max: 1403cGy	-2.5%
	Mean: 996cGy	Mean: 1140cGy	13.5%
Rt Cochlea	Max: 457cGy	Max: 523cGy	13.5%
	Mean: 376cGy	Mean: 400cGy	6.2%
Lt Lens	Max: 359cGy	Max: 299cGy	-10.8%
Rt Lens	Max: 357cGy	Max: 271cGy	-27.4%
Lt Optic Nerve	Max: 3266cGy	Max: 2634cGy	-21.4%
Rt Optic Nerve	Max: 2847cGy	Max: 2052cGy	-32.5%
Pituitary	Mean: 2267cGy	Mean: 1776cGy	-24.3%
Rt Eye	Max: 1290cGy	Max: 898cGy	-35.8%
	Mean: 551cGy	Mean: 394cGy	-33.2%
Lt Eye	Max: 1645cGy	Max: 927cGy	-55.8%
	Mean: 533cGy	Mean: 445cGy	-18%
PTV	100%	98%	-1.6%
Boost PTV	97.5%	96%	-2%

Table 2 Average OAR and Target coverage for brain treatment site.

## Conclusions

Auto-planning tool produces a clinically treatable plan in most cases, whether the plan is complex or not, by minimally providing a good plan up-front. The treatment planner could create an even more optimal plan, if needed. The auto-plans that were created were not the finishing point. They could have been optimized further to determine whether Organs at Risk are truly as low as reasonably achievable. In general, clinically acceptable and treatable plans could be created regardless of a treatment planner’s skill.

## References

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