Introduction

- Cervical cancer has a high incidence and mortality rate in low- and middle-income countries (LMICs) largely due to limited resources and insufficient staffing.
- Knowledge-based planning (KBP) could ease the burden of staff insufficiencies by creating treatable EBRT plans with low levels of planner intervention.
- Aim: To use Varian’s KBP system (RapidPlan™) to develop a model capable of producing volumetric modulated arc therapy (VMAT) plans for cervical cancer patients.

Methods & Materials

- All cervical cancer patient plans used in this study were previously planned and treated at MD Anderson Cancer Center (MDACC) using IMRT or VMAT techniques.
- Knowledge-based planning (KBP) plans for cervical cancer patients.
- A TOST test showed that the p-values for the PTV_High D<sub>95.0%</sub> (p<0.001), rectum V<sub>70cc</sub> (p=0.039), and mean dose to the bladder (p=0.0014), rectum (p=0.025), and bowel (p=0.006) were statistically significant within a 5% equivalence margin thereby providing strong evidence of equivalence.
- Based on this statistical analysis, it was determined that the model was capable of generating treatable VMAT plans for cervical cancer patients.

Results

- A TOST test showed that the p-values for the PTV<sub>H</sub> D<sub>95.0%</sub> (p<0.001), rectum V<sub>70cc</sub> (p=0.039), and mean dose to the bladder (p=0.0014), rectum (p=0.025), and bowel (p=0.006) were statistically significant within a 5% equivalence margin thereby providing strong evidence of equivalence.
- Based on this statistical analysis, it was determined that the model was capable of generating treatable VMAT plans for cervical cancer patients.

Discussion

- This study showed that the RapidPlan™ model produced treatment plans similar to the previously treated clinical plans in a single optimization with minimal adjustments to normalization.
- A limitation to the model was that planning structures (aside from a pPTV) were not created for the validation plans.
- Since all patients were randomly selected, cervical cancer stages were not taken into consideration during the model configuration.
- Patients were treated to different prescriptions doses, with some prescribed to one dose level while others were prescribed to two dose levels. This could have affected the model’s capabilities.

Conclusion

- The RapidPlan™ model configured, trained, and validated by this study successfully generated radiotherapy plans for cervical cancer patients. In its current state, the model is capable of generating plans similar to the previously treated clinical plans, making it a viable tool for treating cervical cancer patients in LMICs. In the future, the model could be refined in order to produce plans that are superior to manually generated plans. The implementation of the model would ultimately streamline the treatment planning process and improve access to high quality radiotherapy for cervical cancer patients around the world.

References