Development and Implementation of ESAPI Scripting for Standardization and Efficiency in the Medical Dosimetry Clinical Workflow

Eugene M. & Christine E. Lynn Cancer Institute
BAPTIST HEALTH SOUTH FLORIDA

Noufal Manthala Padannayil[1], Shyam Pokharel[1] , Somol Mariam Sunny[1], Rachel O Jacques[1], Michael Kasper[1], Suresh Rana[1]

[1]*Department of Radiation Oncology, Lynn Cancer Institute, Boca Raton Regional Hospital, Baptist Health South Florida, Boca Raton, Florida.*

INTRODUCTION & OBJECTIVE

- Current commercially available script-based tools are utilized to enhance the efficiency of the workflow in the medical dosimetry department.
- This study aims to develop and test in-house .NET framework-based C# scripts to improve the standardization and efficiency of the dosimetry-related workflow with focus on
  - *Contouring* and *Treatment Planning* within the Eclipse treatment planning system (TPS).

MATERIAL & METHODS

- The in-house scripts were developed in C# using Microsoft Visual Studio and the Eclipse Scripting API, a Microsoft .NET class library.
- This integration extends the functionality of Eclipse. Three different scripts were developed to perform key tasks:
- **OAR Template Helper** – Prepares contouring tasks by loading organ-at-risk (OAR) and target structure names according to institutional protocols to ensure naming consistency.
  - It works in conjunction with commercially available auto-contouring tools such as Limbus AI to load user-requested contours and OAR names.
- **Opti Helper** – Assists in defining optimization target volumes, ring structures, and exclusion structures for different disease sites based on user input.
- **Auto Planning Helper** – Automates the setup of beam templates and applies available RapidPlan models to generate an initial optimization template. This creates a base plan that can be further refined by the dosimetrist.
- All scripts were tested and evaluated in a test environment of Eclipse TPS. The validation process involved an anonymized dataset of five patient cases from different treatment sites, which include prostate, breast, head and neck, and brain.
- The evaluation was conducted prior to clinical implementation to ensure robustness and accuracy.

RESULTS

- All the modules were tested without errors in an anonymized patient dataset across various disease sites.

Figure 1: Shows the graphical user interface of: (a) OARs template helper – allows the user to load predefined structures and match them with automatically generated contours from Limbus AI. (b) Opti helper – assists in the creation of optimization structures (Prostate&LNs in above example), (c) for general simultaneous integrated boost (SIB) and sequential multiple target and OAR optimization structure creation.

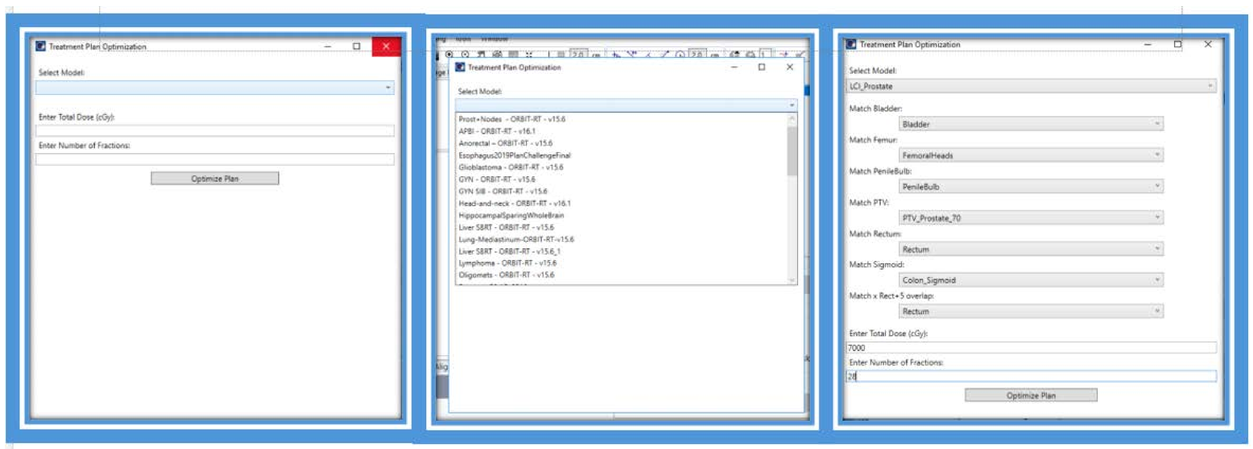

Figure 2: Shows the graphical user interface of the Auto planner helper, illustrating its three-stage process: RapidPlan Model Loading, matching Rapid Plan structures with the loaded structure names, and Optimization Preparation.

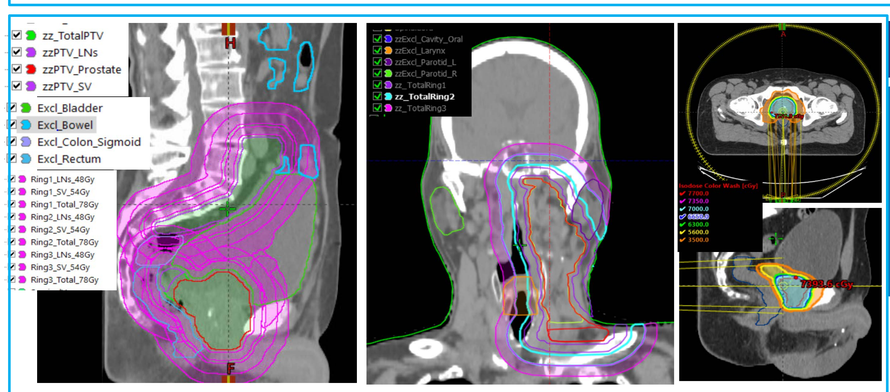

Figure 3: Examples of optimization structure creation for prostate and head & neck (HN) cases using the Opti Helper script, along with automated planning dose distribution for the prostate.

CONCLUSION

- The implementation of ESAPI scripting improves standardization and enhances the efficiency of the dosimetry workflow in the Eclipse TPS.

Corresponding Author: Noufal Padannayil, PhD, CMD
Email: manthalapadannayil.noufal@baptisthealth.net
noufalsh@gmail.com