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

2026 JOINT AAPM | COMP MEETING
JULY 19–22 | VANCOUVER, BC

Development and implementation of an in-house ESAPI C# automation framework with a dynamic universal GUI for optimization structure creation across treatment sites

Noufal Manthala Padannayil[1], Nishan Shrestha[1], Rachel Jacques[1], Shyam Pokharel[1], Suresh Rana[1,2]

[1]*Radiation Oncology, Lynn Cancer Institute, Boca Raton Regional Hospital, Boca Raton, FL, United States of America*
[2]*Oncological Sciences, Florida International University, Miami, FL, United States of America*

Objective

To develop and evaluate an in-house .NET/C# Eclipse Scripting API (ESAPI) solution with a dynamic universal graphical user interface (UGUI) to automate optimization-structure creation across disease sites and reduce treatment planning time.

Methods

- ❑ A generalized C# framework was developed in Microsoft Visual Studio using ESAPI within Eclipse TPS v18.1.
- ❑ The UGUI dynamically adapts to user-defined inputs, including the number of targets and organs at risk (OARs), ring parameters, cropping limits, and selected dose levels.
- ❑ Two workflow-specific modules were implemented: (1) simultaneous integrated boost (SIB) and (2) sequential planning. Scripts were tested in a non-clinical Eclipse environment and validated using anonymized patient datasets from multiple treatment sites, including prostate, breast, head and neck, and brain.
- ❑ Efficiency was quantified by comparing the time required for manual optimization-structure creation versus the automated scripting workflow.

Results

- ❑ For both SIB and sequential workflows, the UGUI guides users through selecting targets/OARs and entering standardized margins (e.g., PTV-to-ring spacing and OAR exclusion/cropping distances).
- ❑ The script then automatically generates planning rings and OAR optimization helper structures by cropping OAR volumes away from the target volumes using user-defined distances.
- ❑ For SIB planning, the tool supports multiple PTVs with user-specified dose levels and creates dose-priority cropping and per-PTV ring structures.
- ❑ For sequential workflows, the tool supports single-target prescriptions with the same automated ring and OAR-cropping logic. Across disease sites, the script standardized optimization-structure generation and substantially reduced manual contouring effort, decreasing mean ± SD creation time from 18.75 ± 5.03 minutes (manual) to 1.13 ± 0.29 minutes (automated).

Conclusions

- ❑ This in-house, department-developed ESAPI automation framework delivers a scalable, disease-site–independent method for optimization-structure generation and substantially improves planning efficiency.
- ❑ The work demonstrates the impact of internally developed clinical automation to standardize workflows and reduce repetitive planning tasks within the department.

Results

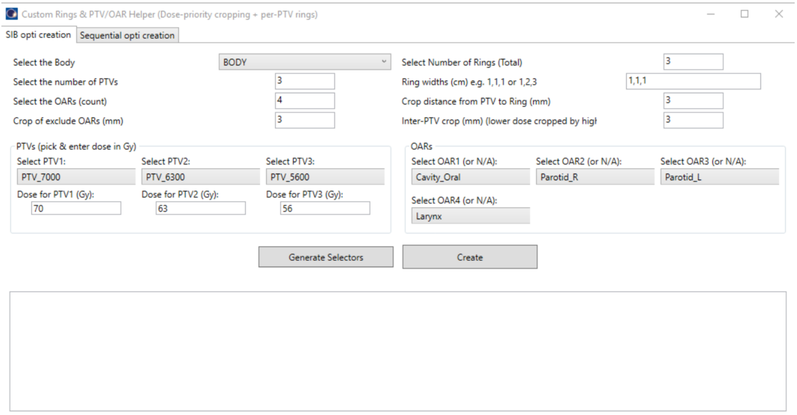

Figure 1: Universal graphical user interface (UGUI) for the SIB planning workflow developed using the Eclipse Scripting API (ESAPI).

Corresponding Author

Suresh Rana, PhD; AVP and Chief of Medical Physics
- *Email: sureshr@baptisthealth.net or suresh.rana@gmailcom*
- *Phone: 1-405-795-6697*