2020 / EZFLUENCE CASE STUDY

University of Zurich Improves 3D Treatment Planning with EZFluence

Department of Radiation Oncology at the University of Zurich, Switzerland

Introduction

The department of radiation oncology at the University of Zurich has successfully implemented Radformation's EZFluence software. An automated 3D treatment planning script, EZFluence has streamlined their electronic compensator and field-in-field planning workflows, resulting in tangible time savings and measurable improvements in key plan quality metrics.

The department at the University of Zurich is one of the largest and busiest in Switzerland, delivering care to approximately 100 patients per day with a full complement of advanced radiotherapy equipment including multiple Varian TrueBeam linear accelerators, a ViewRay MRIdian, Elekta brachytherapy, and an Xstrahl superficial unit. The department specializes in stereotactic treatments and actively participates in clinical trials and other research.

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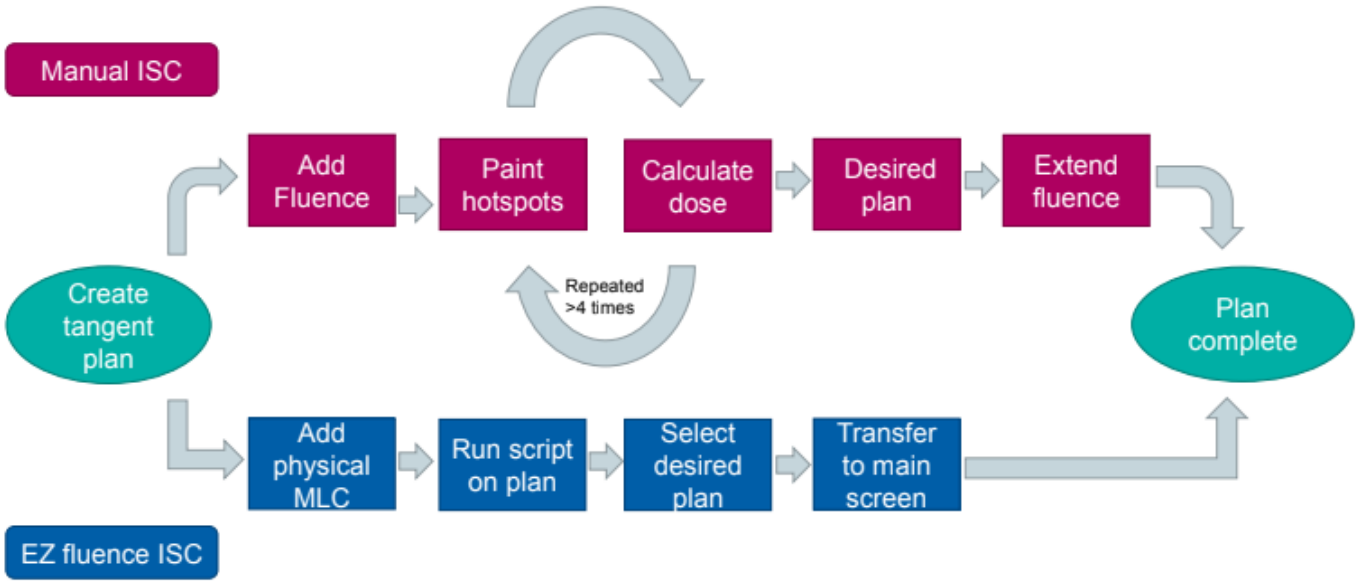
Standard Planning Methods

When assessing clinical resource allocation in their busy clinic, the staff came to realize that 3D planning for breast cases was comparatively onerous. “We were spending too much time on electronic compensator plans,” said medical physicist Dr. Lotte Wilke. Electronic compensators are a modern form of irregular surface compensator (ISC) planning, which employs MLCs in place of traditional physical compensators to modulate open fields to create a homogeneous dose distribution. Planning ISC with Eclipse fluence editing tools is an iterative process involving multiple dose calculations and dose “painting” to arrive at an ideal dose distribution using a sliding window delivery that delivers even target dose but decreases dose to organs at risk (OARs).

Planning field-in-field cases, done primarily for whole brain treatments at the University of Zurich, is similarly time consuming and iterative. For this technique, main fields are calculated and subsequently copied as subfields, whose MLCs are then manipulated to augment the open field dose. After the manual creation of each segment, dose recalculation and plan re-evaluation is required until a clinically acceptable plan is achieved with homogeneous dose and reasonable maximum doses.

With a large volume of patients requiring these planning techniques for treatment, the University of Zurich implemented EZFluence to simplify 3D breast and whole brain planning and eliminate the need for iterative planning. Initial planning results using the software were promising.



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According to Dr. Wilke, EZFluence "improved the speed of 3D planning a lot. We no longer need to adjust the fluence manually, which was time-consuming." Instead, EZFluence automates the iterative portions of the planning, presenting a number of plans to choose from along with a number of customization features to further enhance plans to achieve clinical goals. "Being able to generate multiple plans quickly and being able to go back to previous versions of your plan has proven especially useful," said Dr. Wilke.

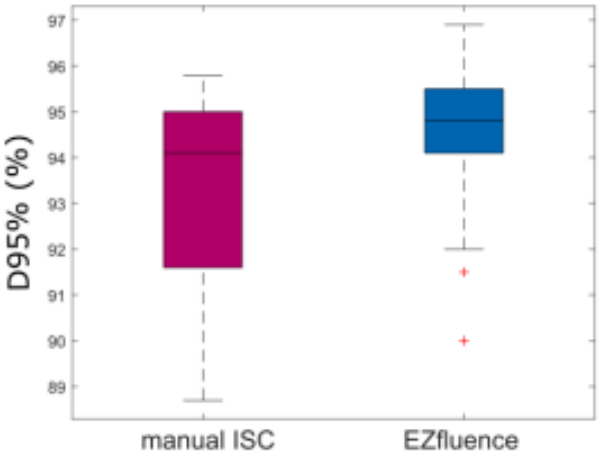
Quantifying Improvements

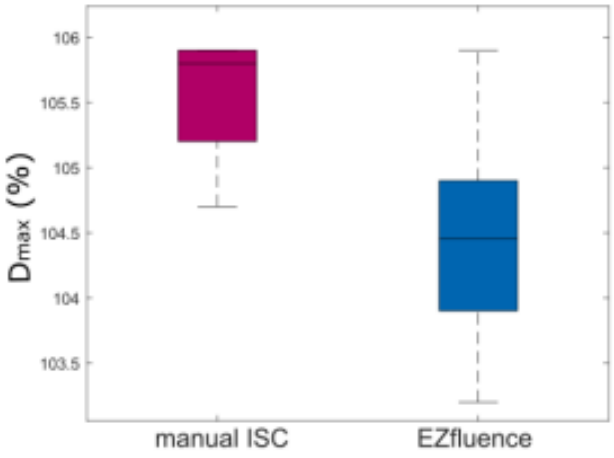
Seeing initial success with EZFluence for breast and whole brain planning, dosimetrist Jessica Van Rossum set out to validate the software, analyzing time savings and plan quality metrics. The results of her work were presented at the Scientific Association of Swiss Radiation Oncology (SASRO) 2019 annual meeting.

In the investigation, a cohort of 14 randomly selected breast patients was planned in two ways: by electronic compensation using Eclipse fluence editing tools as well as by automatic plan generation with EZFluence software. The plans were compared to evaluate PTV coverage, hot spot volume, dose to organs-at-risk, and associated planning times.

The comparison study concluded that plans generated by EZFluence showed slightly improved PTV coverage compared to manual planning as assessed by the D95% dose coverage metric. Manual plans showed an average D95% dose coverage of 94.1% compared to 94.8% for EZFluence plans, which also showed reduced plan-to-plan coverage variability. The use of EZFluence to automatically generate breast tangent plans revealed a statistically significant impact on maximum dose, lowering the average hot spot by about 1% overall from 105.8% to 104.5%. Meanwhile, dose to organs-at-risk was largely unchanged.

PTV Evaluation





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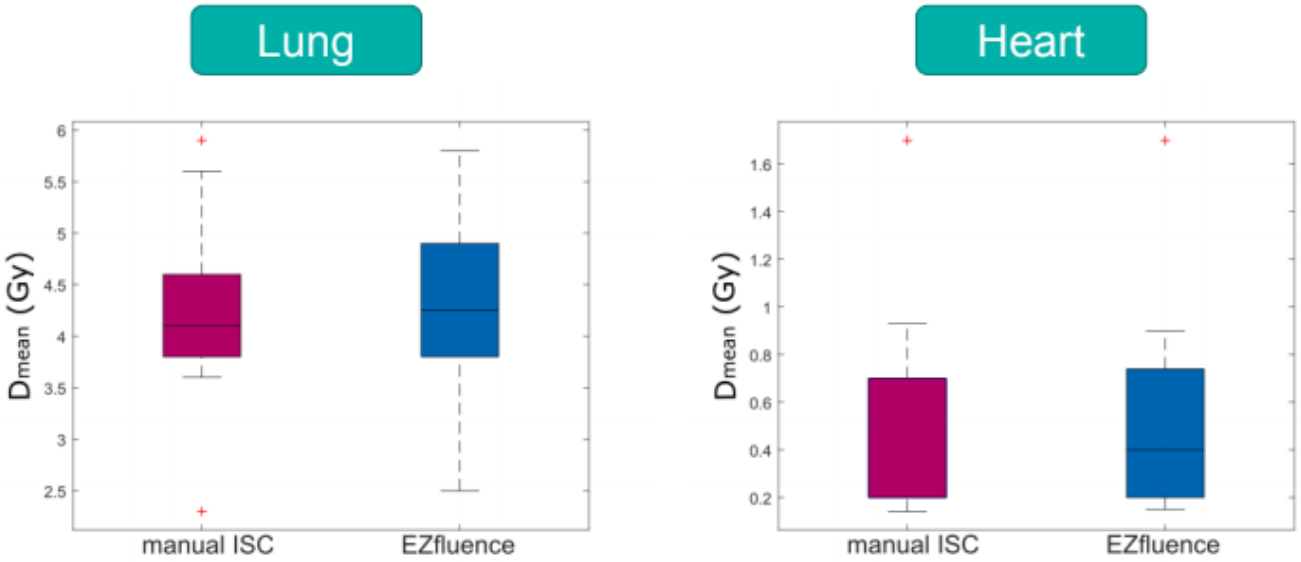
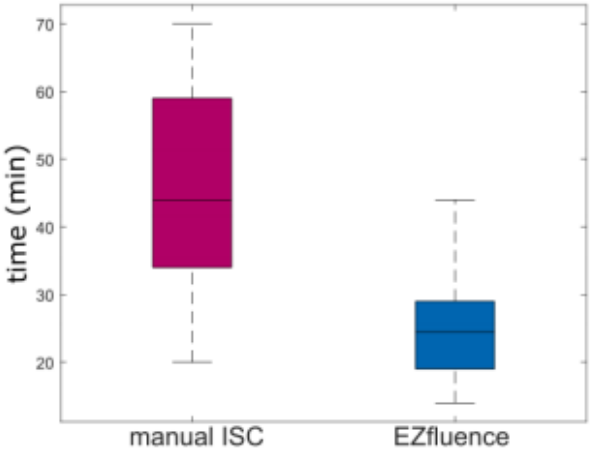
OAR Evaluation



Planning Time Evaluation

The time savings for EZFluence-generated plans was significant. The median planning time was just 25 minutes on average for EZFluence plans compared to 45 minutes for manually generated plans, cutting the time needed for electronic compensator plans nearly in half.



Conclusion

By implementing EZFluence into the clinical workflow for 3D planning, the University of Zurich has greatly improved the efficiency of 3D treatment planning, with quantifiable time savings, reduced planning variability, and improved plan quality. By simplifying a workflow that was previously complex and time-consuming, the department is able to reallocate resources where it matters most.

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