RapidPlan™ PT Knowledge-Based Planning
Global Knowledge Sharing for Proton Therapy

Machine Learning

RapidPlan PT knowledge-based planning represents the next generation of individualized proton treatment planning, allowing clinics to make high quality plans in a fraction of the time.

The power of RapidPlan PT is the innovative software that leverages existing clinical knowledge combined with machine learning to create quality plans, quickly and consistently. By building and sharing models based on previously treated patients, RapidPlan PT can allow clinics to reduce variability in treatment planning to achieve greater consistency, efficiency, and quality in patient care.

Using patient-specific anatomy, treatment plans, and prescription information, RapidPlan PT can build a model that will then estimate the DVH for a new patient. This estimated DVH can be used as a personalized starting point for intensity modulated proton therapy (IMPT). The models do not include patient information, so they can easily be shared between proton centers, providing a realistic pathway to share experience.

Knowledge-Guided Decision Support

RapidPlan PT can help guide the right treatment for each patient. Currently, the decision to treat patients by protons or photons is often done by generating comparative treatment plans, which is time-consuming and challenging. In the first study of its kind, researchers from VU University Medical Center (VUMC), now part of Amsterdam University Medical Centers, were able to build a decision support tool using RapidPlan predictions. They did this by creating radiotherapy and proton therapy RapidPlan dose prediction models for head and neck cancer and then used these models to predict which treatment modality would spare more healthy tissue. According to VUMC researchers, RapidPlan model-based dose prediction capabilities may help eliminate the need to make a comparative plan, allowing for quick decisions based on a chosen threshold.

Key Benefits

Now with IMPT DVH prediction capability in addition to intensity modulated radiation therapy (IMRT) and volumetric modulated arc therapy (VMAT), RapidPlan PT lays the framework for efficient patient-specific decision support. High quality patient-specific plans can be created for each modality, streamlining the time-consuming process of comparative planning.

Moving beyond static templates, DVH estimation models are powerful dynamic tools that adapt and evolve to meet the unique planning needs of each institution. As the DVH estimation model improves quality and consistency in treatment planning, these improved plans can be fed back into the model, thereby improving the model in a machine learning framework.
"This is the first investigation which demonstrates the feasibility of patient selection for proton therapy based solely on patient-specific knowledge-based predictions of proton and photon plan dosimetry, without necessitating actual plan creation."

- A. Delaney et. al. ²

This knowledge-based planning approach can also potentially be used to predict differential side effects of proton therapy vs. radiotherapy through normal tissue complication probability (NTCP) models. By linking the NTCP to each treatment plan model for each modality, clinicians could predict the likelihood of a patient-specific adverse side effects based on different estimated doses. This approach could easily be extended to take patients’ preferences into account, allowing them to choose their treatment based on likelihood of toxicities.

With the number of proton centers increasing rapidly worldwide, RapidPlan PT has the potential to bridge the IMPT learning curve, improve quality and consistency, increase efficiency, and provide truly individualized patient care.