Automatic treatment planning implementation using a database of previously treated patients

Joseph A. Moore1, Kimberly T. Evans1, Wuyang Yang1, Joseph Herman1, Todd R. McNutt1

1Department of Radiation Oncology, Johns Hopkins University, Baltimore, Maryland

Purpose/Objectives

• Using a database of prior patient dose and shape relationships allows for the prediction of dose on future patients.
• Automatic planning improves the speed of treatment planning by providing a good initial plan for the dosimetrist to start from.
• Database driven solutions improve quality by predicting the lowest known achievable critical structure dose from prior patients.
• Safety is improved by showing suggesting solutions that are more realistic.
• Toxicity and other planning data can be recorded to improve plan selection.

Materials/Methods

• A patient population of 53 patients from 3 institutions is contained within the database.
• Dose and structure data is available for 46 patients from 2 institutions.
• Prior planning information is stored in an Microsoft SQL Server 2005 relational database.
• Automated scripts written in Python and connected to Pinnacle 9.4.
• Structures that are not contoured by the physician or are misnamed are identified.
• Selects a dose grid that covers all relevant structures.
• Sets a prescription based upon the selected plan type.
• Places an isocenter in the center of the primary target.
• Combines common OARs.
• Adds ring structures.
• Structures marked as None are ignored.
• Structures that are not constrained by the physician or are misnamed are identified.
• Duplicate structures in the mapping process are identified.

Conclusions

• After OVHs have been calculated for each structure, the automatic planning tool allows for querying of the optimization objectives from the database.
• The interface allows for selection from a predefined set of prescriptions.
• New prescriptions can be added by defining parameters in a comma separated value text file.
• The query selects from the patients in the database those which have achieved a target dose greater or equal to the prescription target dose.
• For each structure, the patients which have the same or closer shape relationship between the target and structure is selected. The lowest achievable dose from this group is returned by the query.
• The automatic planning tool allows for faster planning while improving safety and plan quality.
• Uncommon names can be renamed manually.
• Common alternative structure names are automatically mapped to standard names.
• Uncommon names can be renamed manually.
• Structures are grouped into PTV, OAR and None.
• PTV’s and OARs are added to database.
• Structures marked as None are ignored.
• The planning tool allows for typical plans to be rapidly generated from just the plan contours with several selectable options.
• Adds ring structures.
• Combines common OARs.
• Places an isocenter in the center of the primary target.
• Sets a prescription based upon the selected plan type.
• Adds a pre-defined set of beam at a selected energy for a specified machine.
• Selects a dose grid that covers all relevant structures.
• Software verifies required structures are present.
• Structures that are not constrained by the physician or are misnamed are identified.
• Duplicate structures in the mapping process are identified.
• User is prompted before the planning tool is started.
• New prescriptions can be added by defining parameters in a comma separated value text file.

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