Multi-institutional plan quality checking tools built on Oncospace: A shared radiation oncology database system

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Purpose/Objectives

RT patients are assumed to be less at risk for treatment related toxicity when Organs At Risk (OARs) are subjected to lower doses of radiation. We aim to use a multi-institutional data store of past treatment experience to develop tools to:
- Check the quality, while controlling for individual patient anatomy, of a single treatment plan against previous plans
- Compare past treatment history between centers to discern institutional patterns and proclivities in OAR sparing

Treatment history is represented as data combined from members of the Oncospace Consortium.

Materials/Methods

Oncospace

The plan quality tools operate on data in the Oncospace Consortium, consisting of instances of the Oncospace system local to each participating center. Each instance has the same data schema, which provides seamless querying across institutions and ease of sharing and combining data.

Oncospace has a database designed for the storage and retrieval of data artifacts of the entire RT experience, including:
- Dose Volume Histograms (DVHs)
- Overlap Volume Histograms (OVHs): A distance relationship between RT targets and critical structure (Figure 1)

Results – Single Plan Quality Check

Plan quality tools were developed jointly between UW and JHSOM.
- To evaluate a single plan – select all patients anatomically harder to plan (lower OVHs) than the candidate, and compare the planned dose level to previously achieved doses. The candidate plan should be among the lowest DVHs.
- To evaluate an institution’s plans – group patients with like anatomy (similar OVH) and calculate mean dose for those patients. Compare that mean dose to similar patients at other institutions.

Multi-institutional plan comparison (Figure 5)

Results (Cont’d)

Conclusions

Oncospace provides a queryable, relational data-store for comparing anatomy to dose to study plan quality questions. The Oncospace Consortium is based on a common schema to combine data across institutions. The tools developed can be used to gain insight about the quality of a candidate treatment plan, or about inter-institutional plan characteristics.

Acknowledgements

Work supported by the Elekta and Toshiba Corporations