

Dosimetry Knowledge Based Treatment

Planning

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Acknowledgement

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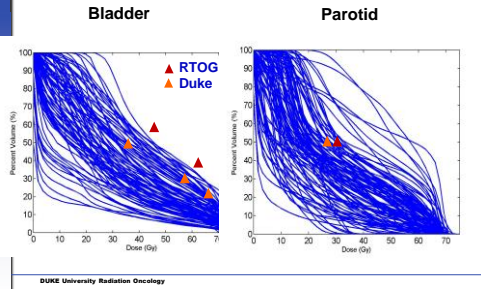
Acknowledgement

- Funding from NIH, Varian Master Research Agreement
- Technology licensed to Varian

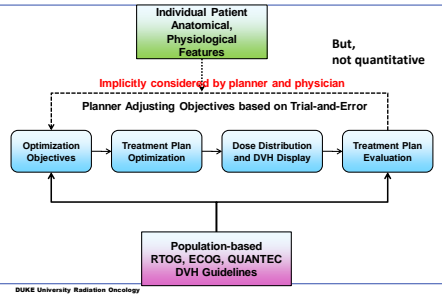
- This study used the models from Duke, although the results are not identical to Varian's RapidPlan, they are indicative of RapidPlan's abilities.

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Planning Objectives vs. Plan Outputs

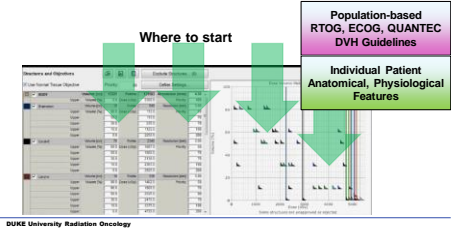


IMRT/VMAT Planning

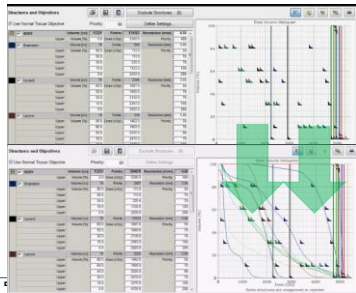


Basics Of Knowledge-Based Planning (KBP)

- Knowledge Models Provide Quantitative, Patient Specific, Optimization Parameters



Basics Of Knowledge-Based Planning (KBP)



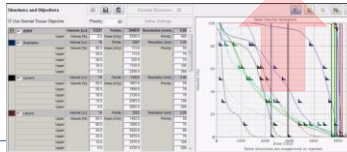
Input from Model

Output from Opt.

Basics Of Knowledge-Based Planning (KBP)



Output from dose calc.



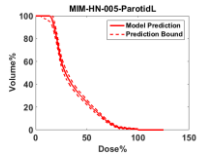
Input from Opt. result

Basics Of Knowledge-Based Planning (KBP)

- Past experience based, anatomy driven
- Identify anatomy and dosimetry features
- Machine learning to model correlations between anatomical and dosimetry features
- Predictions of new patient dose parameters are made based on the anatomy

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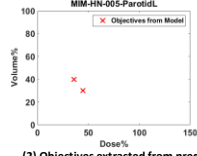
HN Case #5: Parotid L



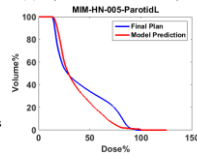
(1) Model prediction curve + bound

PAROTID_L	14.8
Upper	5.9 40.0 1480
Upper	4.4 30.0 3115

(3) Eclipse optimization using objectives



(2) Objectives extracted from prediction



(4) Model prediction and plan DVH curve

Summary

- Modeling features
 - Not limited to dosimetry features
 - Beam angle, beam energy
 - Trade-off preferences can be plan features too
- Presented prior to planning
 - Decision support tool
- Post plan quality evaluation
 - Clinical trials, protocol compliance

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Knowledge Model's Additional Potential



Evaluation of Lung IMRT Plans Using a Knowledge Based Engineering Tool NRG Oncology / RTOG 1308

T. Giaddui, J Yu, L Yuan, W Chen, L Lin, C B Simone II, R Mohan, X Zhang, J Bluett, M T Gillin, Z Liao, K Moore, J D Bradley, E O'Meara, J Presley, J M Galvin, Q J Wu and Y Xiao

ASTRO 2015 Annual Meeting, October 19, 2015

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Courtesy of Giaddui and Yin @NRG



Knowledge Model's Additional Potential

Conclusions

- Plans that were used to guide the development of RTOG 1308 dosimetric criteria are of consistent quality
- Dosimetric criteria adopted in 1308 are generally achievable
- The knowledge engineering tool can be used for plan quality evaluation



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Courtesy of Giaddui and Yin @NRG
