

James B. Yu MD MHS FASTRO^{1,2}, Vikram Jairam MD³, Nat Lester-Coll MD⁴

1. Dartmouth Cancer Centre, Department of Radiation Oncology & Applied Sciences, NH, USA
2. Geisel School of Medicine at Dartmouth, NH, USA
3. Sutter Health, Auburn, CA, USA
4. Department of Radiation Oncology, University of Vermont, VT, USA

INTRODUCTION

Stereotactic body radiation therapy (SBRT) for prostate cancer is generally safe and effective. However, prostate SBRT can cause moderate to severe genitourinary (GU) toxicity in a small minority of patients. If there are patients that are at greater risk of experiencing GU toxicity from SBRT vs. moderate hypofractionation, identifying them may allow for switching of therapy from SBRT to moderate hypofractionation (Mod-H). The theoretical value of such a test can be calculated based on information from the literature.

METHOD

We assumed that the performance of a diagnostic test predicting Grade 2 or higher GU late toxicity from prostate SBRT patients would identify patients at 80% risk of such toxicity “high risk”, and that all other patients were at 4% risk “low risk”. 15% of patients were considered high risk by testing. We assumed the non-tested cohort would be at the same aggregate risk (15.4%).

Using TreeAge, we created a decision tree with a choice between SBRT without testing for toxicity risk or testing for toxicity risk and subsequent SBRT for standard risk or Mod-H for high risk. Based on literature, we assumed baseline post-SBRT Quality Adjusted Life Years (QALY) of 10.2, the cost of SBRT and Mod-H were \$19,275 and \$21,904, the cost of grade 2 or higher toxicity was \$1,068, and a permanent negative impact on quality adjusted life decrement of 0.12 for late genitourinary toxicity, starting 2 years after treatment.

As a sensitivity analysis, we evaluated toxicity starting immediately post treatment, as well as reducing the cost of GU toxicity to \$145. To evaluate the assumption that the test can predict a low risk of GU toxicity vs. predicting a standard risk, we varied the risk of GU toxicity of the patients who were tested as low risk up from 4% to the standard risk of 15.4%. Finally, we evaluated the cost of the test ranging from \$0 to \$10,000.

RESULTS

Without charging for the test, the strategy of testing resulted in 10.14 QALY's at a cost of \$19,730. The strategy of not testing resulted in 10.05 QALY's at a cost of \$19,439. This translated to a relative cost of \$3,233 per QALY gained by free testing. The cost due to testing (despite not charging for it) was due to the increased cost of patients undergoing Mod-H.

If patients who experienced GU toxicity started immediately post treatment, the strategy of testing resulted in 10.13 QALY's and the strategy of not testing was reduced to 10.01 QALY. Raising the probability of toxicity for patients who tested low risk revealed that above a rate of GU toxicity of 14.5%, the willingness to pay rose above \$50,000/QALY.

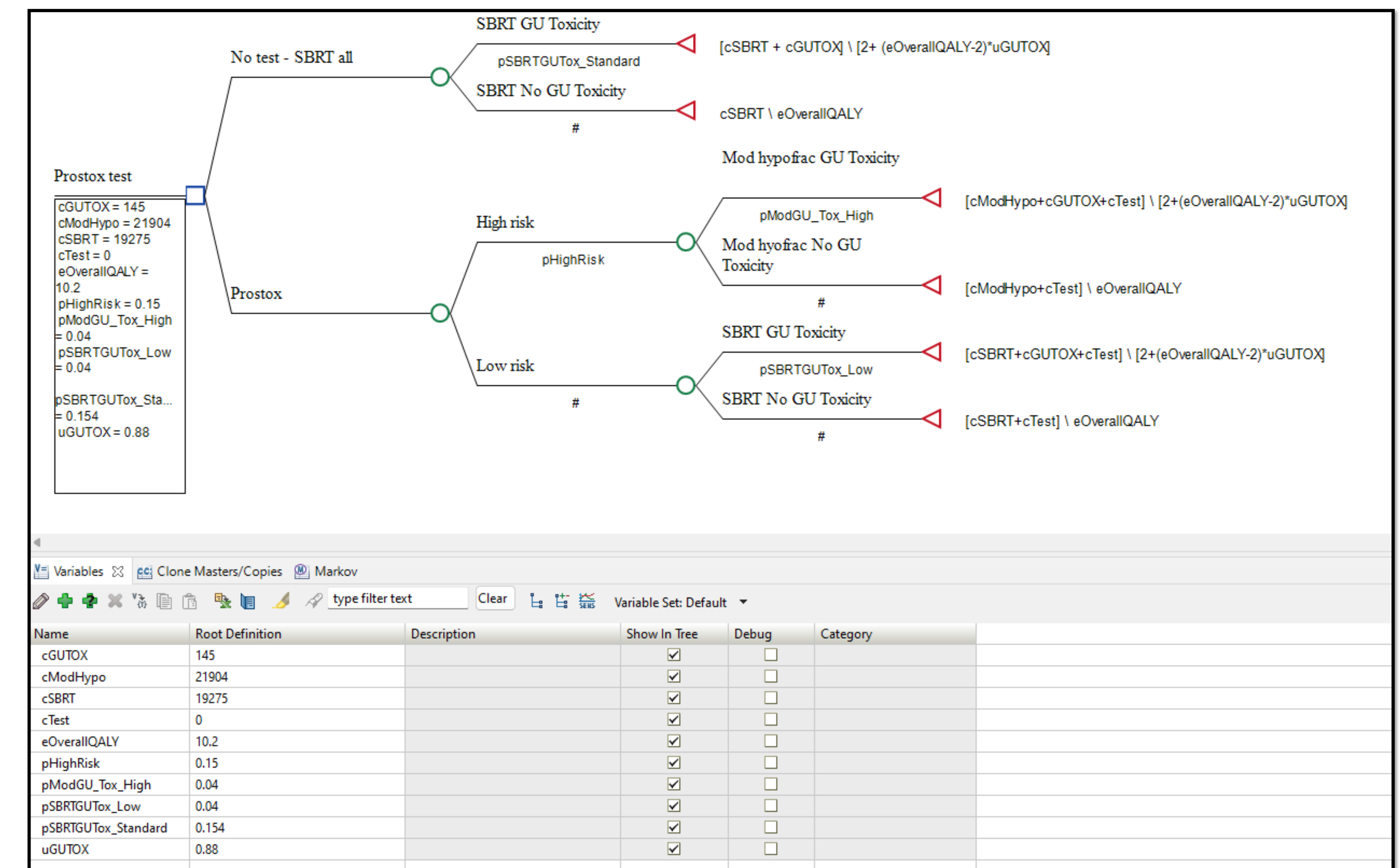
Finally, assuming a lower cost of GU toxicity (\$145) reduced the cost of the not testing strategy to \$19,297 and the testing strategy to \$19,675 without impacting QALY's.

Assuming a testing charge of \$1,000 resulted in a testing ICER of \$15,333 per QALY gained (vs. not testing).

A societal willingness-to-pay of \$50,000 would theoretically justify a test cost of \$4,120.

Variable		Source
Baseline QALY (No toxicity)	10.2 QALY	Cooperberg et al.
Cost		
Assumed range of test cost	\$0-\$10,000	
Cost of Urinary toxicity	\$1,068	Sher et al.
Low estimate of cost of urinary toxicity	\$145	Yu et al.
Cost of moderate hypofractionation	\$21,904	Ranh Voong et al.
Cost of SBRT (robotic)	\$19,275	Sher et al.
Utility or Probability		
Utility of urinary toxicity	0.88	Gold et al.
Probability of being “high risk”	0.15	Kishan et al.
Probability of urinary toxicity if “high risk”	0.8	Kishan et al.
Probability of urinary toxicity if “low risk”	0.04	Kishan et al.
Probability of urinary toxicity if untested	0.154	Kishan et al.
Probability of urinary toxicity for Moderate hypofractionation	0.154	Same as SBRT

DECISION TREE



REFERENCES

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CONCLUSIONS

Testing for the prevention of late GU toxicity was associated with slightly increased cost of treatment and improved QALY under the assumptions of the base case model. A range of theoretical charges and assumptions for the test could be justified.

CONTACT INFORMATION

James.b.yu@Hitchcock.org