PhD Thesis title: 'Quantitative comparison of late effects following photon *versus* proton external-beam radiation therapies: Toward an evidence-based approach to selecting a treatment modality'

Author: Rui Zhang
Email: rzhang@marybird.com
Institution: Mary Bird Perkins Cancer Center
Supervisors: Wayne Newhauser
Graduation Date: Dec, 2011
Available on line: http://digitalcommons.library.tmc.edu/utgsbs_dissertations/187/

ABSTRACT:
Radiation therapy has been used as an effective treatment for malignancies in pediatric patients. However, in many cases, radiation side effects diminish these patients' quality of life. In order to develop strategies to minimize radiogenic complications, one must first quantitatively estimate pediatric patients' relative risk for radiogenic late effects, which has not become feasible till recently because of the calculational complexity. The goals of this work were to calculate the dose delivered to tissues and organs in pediatric patients during contemporary photon and proton radiotherapies; to estimate the corresponding risk of radiogenic second cancer and cardiac toxicity based on the calculated doses and on dose-risk models from the literature; to test for the statistical significance of the difference between predicted risks after photon *versus* proton radiotherapies; and to provide a prototype of an evidence-based approach to selecting treatment modalities for pediatric patients, taking second cancer and cardiac toxicity into account. The results showed that proton therapy confers a lower predicted risk of radiogenic second cancer, and lower risks of radiogenic cardiac toxicities, compared to photon therapy. An uncertainty analysis revealed that the qualitative findings of this study are insensitive to changes in a wide variety of host and treatment related factors.

References to author publications that relate specifically to the dissertation:

1. **Rui Zhang**, Rebecca Howell, Annelise Giebeler, Phillip Taddei, Anita Mahajan, Carol Etzel, Wayne Newhauser, "Risk of radiogenic cardiac toxicity for a sample of pediatric medulloblastoma patients", *in preparation*
2. **Rui Zhang**, Rebecca Howell, Annelise Giebeler, Phillip Taddei, Anita Mahajan and Wayne Newhauser, "Calculation of the risk of cardiac toxicity for a pediatric medlloblastoma patient treated with proton and photon craniospinal irradiation", *in preparation*
3. **Rui Zhang**, Rebecca Howell, Annelise Giebeler, Phillip Taddei, Anita Mahajan and Wayne Newhauser, "Comparison of risks of second cancer between photon and proton therapies for a pediatric medulloblastoma patient" *in preparation*