Robust Treatment Comparison Based on Utilities of Semi-Competing Risks in Non-small-cell Lung Cancer

**Abstract**: This talk will describe a design for a randomized clinical trial comparing two second-line treatments for recurrent non-small-cell lung cancer, chemotherapy versus chemotherapy plus reirradiation. The research question is whether the potential efficacy benefit that combining reirradiation with chemotherapy may provide justifies its potential for increasing the risk for severe adverse events. The design uses two co-primary endpoints: time to disease progression or death, and time to first severe toxicity. Because follow-up ends at a second recurrence or death, the two outcomes are semi-competing risks. A conditionally conjugate Bayesian model that is robust to misspecification is formulated using piecewise exponential distributions. A numerical utility function is elicited from the physicians that characterizes the desirability of the possible realizations for the co-primary endpoints. A comparative test based on posterior mean utilities is proposed. A simulation study is presented to evaluate test performance for a variety of treatment differences, and a sensitivity assessment to the elicited utility function is performed. General guidelines are given for designing a utility-based trial in a similar setting.