AbstractID: 9707 Title: A decision aid for IMRT treatment plan selection combining a Bayesian Network, a Markov Model, and patient preferences.

Purpose:

To develop the decision making component of a multiobjective IMRT optimization procedure for prostate cancer that incorporates disparate sources of information used in clinical decision making, the uncertain outcomes inherent in medical prognosis and the preferences of the patient.

Methods:

Currently, many IMRT plans are developed for each patient without indication of which plan provides the optimal balance between tumor control and complication probability. We chose a Bayesian Network (BN) coupled with a Markov Model (MM) and utility theory to calculate Quality Adjusted Life Expectancy (QALE) for IMRT treatment of prostate cancer. The BN was constructed with the advice of experts; conditional probabilities were obtained from the literature and expert opinion. Local, regional, and distant control were included as were complications to bladder and rectum. The MM relied on transition probabilities derived from the BN, published clinical trials and life expectancy tables. Utilities were obtained from the literature.

Results:

Probabilities of disease control matched published values well, as did life expectancies. Sensitivity analyses highlighted critical nodes in the network. Analysis of outcomes versus probability of lymph node involvement provided a basis for decisions regarding pelvic irradiation. A BN is well-suited to handle the disparate nature of clinical variables. QALE provides a method for ranking plans based on clinically relevant criteria that incorporates the probabilistic nature of the outcome.

Conclusion:

A decision aid was constructed using a Bayesian Network coupled to a Markov Model. This resulted in the ability to rank plans based either on QALE or specific outcomes.