Prescription of radiation, in the early trials of ICRT, has been done in three distinctly different ways. In some trials, radiation has been prescribed at a fixed distance from the center of the source with the dose or distance being adjusted depending upon the reference vessel diameter. In other studies employing a balloon-centering device, the radiation has been prescribed at the balloon-lumen interface or at some depth from this structure. In addition, two trials have been completed where the investigators attempted to limit the maximum dose delivered to the media based on calculations of the delivered dose to a single near point in the treatment volume. However, none of these methods address whether the prescribed treatment will deliver the desired dose to the entire vessel wall. A goal of intravascular brachytherapy treatment planning is to enable the clinician to make a rapid, pre-treatment evaluation of the radiation dose delivered to the target structure and surrounding tissue and determine whether it is optimal.

Our institution has developed a real-time, three-dimensional (3-D) treatment planning system (*iPlan*™) for intravascular brachytherapy using intravascular ultrasound (IVUS) data. This systems allows the clinician to prospectively plan and evaluate the treatment delivered to the vessel wall using spatial dose distributions, dose volume histograms and figures of merit. The system allows various source delivery devices such as non-centered or lumen-centered source trains with ^{90}Sr/Y, ^{192}Ir and ^{125}I seeds. Data will be presented which illustrates the use of treatment planning with clinical case examples from various clinical trials. In addition, a retrospective dosimetric comparison of beta versus gamma and centered versus non-centered will be presented using IVUS data from clinical trials. The use of figures of merit for ranking various delivery systems for a specific patient treatment will be described as an example of a rapid clinical decision-making tool. Finally, the usefulness of treatment planning in the clinical environment will also be addressed which correlates dose with treatment outcome. Intravascular treatment planning provides a powerful software system, which may ultimately lead to an improved and efficient treatment plan.

Educational objectives include:

1. Concepts and implementation of treatment planning for intravascular brachytherapy.
2. Dosimetric comparisons of different source delivery systems using patient IVUS-data from IVBT trials.