AbstractID: 11922 Title: Automated Segmentation for Radiotherapy Volume Definition

One of the more exciting advances in radiation therapy is the potential for customizing therapy for each patient through the model of adaptive radiation therapy (ART). This includes obtaining 3-dimensional functional and anatomic images throughout the course of therapy using both in-room and conventional imaging platforms. Image acquisition is only the first step in monitoring the quality and efficacy of treatments. The images need to be segmented to allow dosimetric evaluations and comparisons with earlier image datasets. The comparisons will be conducted both to evaluate dose distribution delivery and radiation response and may require acquisition and analysis of multiple image datasets throughout therapy. One of the greatest time consuming aspects of radiation therapy treatment planning is the process of segmenting tumors and normal organs. The expectation that the manpower bandwidth will be available to significantly increase this workload is not realistic, so automated and validated technologies will be necessary to enable wide-spread implementation of ART. One of the greatest challenges for ART will be to develop efficient and effective methods for reviewing the automated segmentation output. The current paradigm of evaluating structure contours on a slice-by-slice basis is too time consuming and does not take advantage of the natural anatomic characteristics of the structures being reviewed. A more efficient method for segmentation review will be required. Automated techniques will also be necessary to map tissue deformation that occurs due to normal day-to-day setup and internal organ variations as well as radiation response and disease progression or regression. This symposium will present the state-of-the art in automated segmentation, deformable image registration, and segmentation review technologies, technologies that will be critical to the effective implementation of ART.