

AbstractID: 11924 Title: Imaging and Treatment Planning for Adaptive Radiotherapy in the Head and Neck

The integration of in-room volumetric imaging into the treatment delivery process has provided the ability to identify soft tissue changes in the head and neck over the course of radiotherapy. These changes include tumor response and changes in the position and volume of normal tissues. When these changes are substantial, registration of the daily online image to the planning image becomes challenging, if not impossible, and may result in a large change in the intended dose to the tumor and a violation of the dose constraints for the surrounding normal tissue. Research has begun to examine the implications associated with addressing these issues through adaptive radiotherapy, and commercial treatment planning systems are beginning to include the structure necessary for handling these changes. This symposium will describe techniques for performing adaptive radiotherapy including imaging for adaptive radiotherapy, deformable registration and dose accumulation, replanning and re-optimization which includes the delivered dose, optimizing re-planning timing, and clinical significance. To address these important issues surrounding imaging and treatment planning for adaptive radiotherapy in response to soft tissue changes, this symposium will be divided into the following four topics. Imaging and immobilization for adaptive radiotherapy in the head and neck will be examined, including identifying the need for replanning, the level of image quality necessary to accomplish this task, as well as immobilization and positioning strategies. Deformable registration and dose accumulation in the head and neck will be discussed, evaluating quality assurance, accuracy, and validation techniques and methods to handle volume reduction. Including the delivered dose, improving efficiency, and optimizing the number and timing of replanning events will be evaluated in the context of replanning and re-optimization for head and neck. The clinical significance of performing adaptive replanning will be highlighted, including a presentation on the results of studies performed and a look to the future as to what studies should be performed.

Educational Objectives:

1. Understand when re-planning is necessary and the level of image quality required for re-planning.
2. Understand the accuracy achievable and validation methods for deformable registration techniques used to relate in-room volumetric imaging to the planning dataset.
3. Discuss dose accumulation, including methods for handling volume reduction and QA.
4. Review and evaluate current state-of-the-art capabilities for re-planning with regards to incorporating delivered dose, efficient workflow, as well as visualization and quantification of results.
5. Explore methods for optimizing the frequency and timing of re-planning events.
6. Understand the clinical significance of adaptive planning with regards to reported results to date and potential future results