AbstractID: 14488 Title: Efficient Outcomes-Driven IMRT Treatment Planning Using Commercial Treatment Planning Systems

The goal of radiation therapy is to deliver a therapeutic dose of radiation to target tissues while minimizing the risks of normal tissue complications. Until recently, the quality of a radiation treatment plan was routinely judged by physical quantities only, i.e., dose and dose-volume parameters, thought to correlate with biological response rather than by estimates of the biological outcome itself. Developments in our understanding of advantages and limitations of existing dose-response models are enabling the incorporation of biological concepts, or at least objective functions with biological relevance, into the routine treatment planning process. Outcomes-driven treatment planning aims to design dose distributions which find a balance between tumor cure and normal tissue damage. Such a multidimensional problem is most appropriately addressed in the framework of constrained treatment planning presently employed for the optimization of IMRT plans. The feedback may be either passive/automated in the case of inverse treatment planning, or with active participation from the planner in the case of forward treatment planning. To address many issues in this emerging topic, AAPM has established a task group (TG166) (1) to review the dose-response models likely to be used in treatment planning process, (2) to discuss strategies, limitations, conditions and cautions for using these models and parameters in clinical treatment planning, (3) to point out dosimetric differences between biologically based and physically based treatment plan optimization and evaluation, and (4) to provide general guidelines and methodology for the acceptance testing, commissioning and routine QA of biologically-based models in treatment planning process. Three of the speakers will discuss the use of commercial systems to do outcomes-driven treatment planning efficiently and effectively, including: the Philips/Pinnacle, CMS/Monaco, and Varian/Eclipse systems. The presenters will share their knowledge and findings concerning the most efficient and effective ways to use these systems such that planning is driven in a direction that is believed to improve outcomes, even though proof that the result is optimal is always lacking. Both radiobiological and dosimetric objective functions will be discussed, especially in the framework of constrained optimization. Multiple datasets and sites will be discussed for each planning system. The presentation is intended to provide familiarity with the tools available to users and also a practical clinical perspective on the magnitude of improvements that one may reasonably expect to be able to achieve. It is becoming increasingly clear that with the right constrained optimization approaches and outcomes-relevant objective functions, IMRT optimization can become much more efficient in terms of user time reductions, while at the same time achieving results that can be judged to push in the direction of improved patient outcomes.