

AbstractID: 2602 Title: Acceptance Testing and Systematic QA

Acceptance testing and systematic QA of planning and delivery of IMRT is different compared to corresponding procedures for other conformal RT techniques. The special hard- and software necessary for the planning and delivery of IMRT is rather complex while the vendors continuously offer improvements of their systems. With respect to the acceptance testing of IMRT delivery systems, high demands are made upon leaf position accuracy, linac performance for small MU delivery, the control system for leaf movement, and leaf speed stability. The treatment planning system requires a thorough insight in the factors determining the accuracy of the dose calculation such as the transmission and leakage through the leaves, the tongue-and-groove effect, the description of the penumbra and the dose outside the high-dose region. Furthermore the accuracy of the calculation of the dose in small fields and the effects of grid size on dose calculation and display should be known. Also the uncertainties in volume determinations and dose-volume histograms have to be assessed. A number of these tests have to be repeated if considerable modifications in hard- or software occur, for instance if a new sequencer is implemented. The routine clinical use of this complex treatment modality requires an efficient QA program, which should include (daily, weekly, monthly....) tests for the safe delivery of complex 3-D dose distributions. Specific tests for individual patient treatments should also be designed, which may include patient-specific measurements and/or an independent dose calculation. Programs for both acceptance testing and systematic QA should be adapted to the complexity of the IMRT techniques applied in a specific center, as well as to the resources available. Finally it can be noted that contrary to the situation in the US, IMRT in Europe was until recently only applied in a relatively small number of, mainly academic, institutions. The reason for this difference in widespread implementation was that in Europe IMRT was considered more as an experimental type of treatment technique requiring considerable resources. In recent years both the hard- and software became more mature, while also more experience with respect to QA of IMRT became available. As a consequence many more institutions, also smaller and busy clinics, started in Europe with IMRT, facing the problem of performing a comprehensive QA program in routine clinical practice. In various European countries (*e.g.*, Spain, Italy and the UK) documents for the guidance for the clinical implementation of IMRT are now in preparation. In these reports recommendations for both physical and clinical aspects of QA of IMRT are provided, while ESTRO is preparing a report dedicated to the verification of IMRT.

Educational Objectives:

1. To understand the special issues related to acceptance testing and systematic QA of planning and delivery of IMRT compared to those required for other conformal RT techniques.
2. To understand the various aspects of design and implementation of a program for acceptance testing and systematic QA of planning and delivery of IMRT.