AbstractID: 9151 Title: Patient-based quality assurance for IMRT

Intensity-modulated radiation therapy is now accepted by the radiotherapy society as a feasible treatment technique and is gaining momentum in the clinical environment. Indeed, with the clinical implementation of IMRT the attention is shifting from feasibility studies towards patient-based studies and the investigation of treatment efficiency. However, off-the-shelf systems are still scarce and the clinical implementation of IMRT requires a substantial effort from the individual centers. The technology has not yet reached maturity and the step from phantom verification to patient treatment is in many respects a jump in the dark. The clinical implementation of IMRT requires the establishment of a complete chain of processes, starting with inverse planning and going right through to verification. Analysis of the QA needs includes careful delineation of the planning and delivery process, documenting where important decisions are made, how information is transferred, what kind of errors are likely or possible and the sensitivity of various parts of the process to errors. In short "hazard analysis". Important is to understand what has not been verified with the applied QA procedure. The quality assurance program can be divided in three classes: machine related QA, pre-treatment QA and treatment QA. Only the latter two in principle, involve patient-based issues. Unfortunately, the conventional methods are no longer valid and the intuition from conventional radiotherapy is lost. In-vivo dosimetry becomes difficult and hand calculation is no longer feasible due to the complexity of the treatment. Moreover, target localization and target volume motion become major parameters in the delivered dose distribution, which is difficult to assess. There is no ideal solution and some of the options are either to perform individualized extensive verification tests prior to each treatment or generalized verification of so-called class-solutions. The verification procedure in turn, can be designed to analyze all variables of the treatment process in detail or be comprehensive. The machine related QA can be seen as a pyramid-shaped approach in that the upper level is build on the quality of the level underneath. The base level comprises basic QA of the linac and MLC; level 2 covers small field dosimetry, small amounts of MUs, and leaf-control properties; level 3, dosimetry of IM beams; and level 4, 3D IMRT verification. In this presentation the issues above will be discussed and clarified with practical examples. Particular emphasis will be given to target volume oriented positioning or image guided radiotherapy (IGRT).

Educational Objectives:

1. To understand the quality assurance issues surrounding IMRT
2. To identify potential sources of errors in IMRT
3. To understand how individual links in the chain of events influence IMRT treatment
4. To understand the difference between phantom and patient related QA
5. To understand the limitation of different MLC delivery methods
6. To understand the impact of target localization and patient positioning on IMRT