

## AbstractID: 4442 Title: QA for Linac kV Imaging Systems

The recent commercialization of linac-mounted kilovoltage imaging systems (i.e., kV systems) has allowed high-precision verification and correction of patient position immediately prior to the delivery of radiation therapy using fluoroscopic, radiographic, or cone-beam tomographic modes. This novel technology challenges the radiotherapy community to redefine their patient positioning practice. One can now correct patient position using image information displaying not only bony anatomy and airways, like portal imaging, but also markers and soft tissue structures within the patient, including the target to be irradiated. On-line kilovoltage imaging further allows, using daily imaging sessions, on-line correction of patient translations and rotations, and the comparison for successive daily volumetric images permits to track changes of anatomy through the course of therapy. Introducing kV systems within busy radiation therapy clinics requires thoughtful testing and quality assurance protocols (QA) of the device, and judicious modification of existing radiation therapy processes and protocols.

The individual components making up kV systems are well-established technologies, and the quality assurance for each component follows accepted standards. However, the specific features of the integrated systems require particular attention. First, the kilovoltage beam may not share a common central axis with the megavoltage treatment beam; therefore, the relation of the kilovoltage imaging matrix to the megavoltage treatment beam must be monitored to ensure adequate localization, scaling, and geometric accuracy. Second, cone-beam tomography differs from conventional or helical CT imaging, and thus encounters specific image quality issues. A well-planned QA program integrates closely the kV system procedures with linac procedures described in accepted QA standards such as the AAPM task group 40 report.

This lecture will present a brief review of commercial systems, but will focus on a suitable QA program, with special emphasis on issues germane to the system and the clinical processes relying on its use. Examples of clinical use in a number of sites will also be presented.

Educational objectives:

1. Understand the technical issues related to kV systems
2. Understand the impact of kV systems on clinical processes
3. Present a comprehensive commissioning protocol and QA program for kV systems.

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