AbstractID: 4422 Title: Daily Localization I: kV/CBCT

Daily target localization is a critical step to secure accurate delivery for 3-D conformal radiation therapy and intensity-modulated radiation therapy. One emerging technology using in-room kilovoltage (kV) imaging has shown to be very promising for targeting treatment volumes. The major advantages of using kV imaging are 1) its comparable contrast between soft tissue and bone structure to that in simulation images, 2) real-time high resolution fluoroscopic imaging, 3) lower radiation dose to patient compared to conventional MV imaging, and 4) availability of reconstructing tomographic images (for example, cone-beam CT) using 2-D kV projection images. At present, different types of in-room kV imaging systems are being developed for different applications such as in-room CT on rail, ceiling-mounted dual-source/detector configuration, and gantry-mounted single source/detector system. In terms of clinical applications, some generate 2-D radiographic images for target verification based on bony marks or implanted surrogator while others generate 3-D tomographic images for target verification based on both soft tissues and bony structures. Some could be used for viewing organ motion to verify applied margin while others could be used for monitoring target motion to verify dynamic delivering or gated treatment. Issues related to the risk and benefit between imaging information and radiation dose using 2-D or 3-D imaging, the geometric accuracy of imaging systems, trade-off between treatment accuracy vs. time required to carry on imaging and manipulation process, early image-guided protocols for basic clinical applications, etc. will be discussed. Some new developments related to effective and efficient use of in-room kV and MV imaging, tomographic image reconstruction using limited number and angle projections have shown very promising for future clinical applications.

This lecture will describe the commercially avaialbe kV imaging systems, as we as their applicable clinical protocols, acceptance testing and commissioning processes, basic QA requirements, system limitations, and potential future developments.

Educational Objectives:

1) Understand the latest commercial available technologies for in-room kV and CBCT systems
2) Understand the basic functionalities of in-room kV imaging system
3) Understand the basic imaging applications
4) Understand the basic system limitations and QA