AbstractID: 14468 Title: Treatment Planning Based On CBCT Images Acquired for On-line Position Verification

The primary purpose of in-room CBCT volumetric 3D verification images is to verify patient position and target localization in real-time. However, they are also used for clinical treatment evaluation or plan modification for adaptive radiation therapy. Daily positioning variation, organ deformation, or tumor shrinkage incur variations in delivered doses to targets as well as critical structures. The evaluation plan calculated based on the verification CBCT images presents the actual dosimetric information with the patient anatomy and position achieved just before the treatment, thus, representing the actual or near treatment delivery.

Unlike helical CT, CBCT involves drawbacks such as limited field-of-view and artifacts affecting accuracy and reproducibility of HU linearity and homogeneity. Studies have shown that CBCT images are being used in volumetric dose calculations for the purpose of evaluation planning and the purpose of planning or adaptive re-planning. Nevertheless, the in-room CBCT is still not optimized for treatment planning purpose and whether CBCT can provide accurate dose calculation results is limited within certain conditions. Such conditions should be addressed for proper use of CBCT in treatment planning. Limitations related to field-of-view and image quality should be emphasized to ensure accuracy and quality in clinical practices. In order to properly and safely utilize the verification in-room CBCT for treatment planning, users should be aware of limitations and concerns of using CBCT for dose calculation. Users also should perform a set of tests to validate use of CBCT for dose calculation and understand the limits for the applications.

This session will review the needs of CBCT-based dose calculation for plan evaluation and plan modification first. Following presentations will present the current status, limitation and concerns of CBCT-based dose calculation for currently available commercial CBCT systems.

Learning objectives:
To understand
1. needs of CBCT-based dose calculation – plan evaluation and/or plan generation modification for adaptive radiation therapy
2. the current status of CBCT image quality and artifacts, and their impact on CBCT-based dose calculation accuracy
3. limitations and concerns in clinical practice
4. future possibilities of in-situ dose calculation.