AbstractID: 14450 Title: Clinical Implementation of Robotic Systems for Brachytherapy

Image-guidance is one of the main aspects of brachytherapy for accuracy and consistency of seed implantation. Modalities such as ultrasonography (U/S), computed tomography (CT), and magnetic resonance (MR) have been integrated with the robots for performing the clinical procedures. Therefore, proper calibration and appropriate testing of the integrated system are critical for achieving the desired treatment, safety and clinical outcome.

However, satisfactory acceptance testing simply assures that the robotic system satisfies all agreed-upon specifications between the vendor and the buyer. The process of commissioning a robot for clinical use should include verification of dosimetric planning system and testing of its accuracy, development of operational procedures, and training of all concerned with the operation of the robotic system. Before introducing any new robotic system in clinical environment, the robustness and reliability of the system should be evaluated. In additional to the traditional tests for brachytherapy, several additional items must be tested before commissioning the robotic system and should be periodically evaluated following a quality assurance program.

Due to the complexity and constraints of the clinical environment where the clinician is an expert with high abilities to detect, analyze and react to unwanted critical situations, the clinician and the robot have to work together in a collaborative synergistic way. Interaction between the robot and the patient is extremely important because of the nature of tasks intended to be performed by a brachytherapy robot. Since the brachytherapy robotic systems carry a surgical tool (needle) and radioactive seeds and come in contact with the patient as well as close proximity to the clinical staffs, the robots have to be at least partly cleanable, sterilizeable (needle and seed passage), robust, reliable and safe. Safety, accuracy, user-friendliness and reliability (SAUR) are the critical criteria that need to be satisfied for any robotic system to be introduced in clinical practice.

Learning Objectives:

1. Review the imaging modalities used for robot-assisted seed implantation
2. Understand the brachytherapy robotic system calibration
3. Understand the commissioning and QA procedures and issues
4. Understand the safety and reliability issues for introducing robotic systems in the clinic