

Quality assurance (QA) for Intensity Modulated Radiation Therapy (IMRT) and Image Guided Radiation therapy (IGRT) is an essential component of the clinical treatment process. The goal of QA is to ensure that the prescribed doses are delivered to the target volume, and that the surrounding critical structures are spared within an acceptable tolerance. There are many sources of error that can arise during IMRT planning and delivery. However, it is ultimately the responsibility of the Medical Physicist to ensure that the prescribed doses agree with the delivered doses. Differences between planned doses and delivered doses in IMRT and IGRT can originate from errors in the treatment planning model, errors in the treatment delivery system, patient setup errors, anatomical changes in the patient, and/or physiological changes in the patient.

The first step in the IMRT QA process is to evaluate the treatment-planning model as part of the initial IMRT commissioning, and again after major software upgrades. The AAPM Task Group 119 (Writing group on IMRT QA) is in the process of developing site-specific acceptance and commissioning tests for treatment planning and delivery systems. These tests evaluate the IMRT system using standardized test plans for multiple geometric and anatomical targets. Using these tests, calculated and measured doses could be compared by medical physicists using their planning and delivery system. Thus providing a standardized mechanism for testing the entire IMRT process from planning to delivery.

An additional source of error in IMRT is the uncertainty in the position and shape of the target volume. The use of image-guided radiation therapy can help minimize, but will not eliminate these errors. Changes in patient setup, normal physiological changes, tumor response, normal tissue response, and weight loss can cause changes in the position of the target volume relative to the surrounding critical structures. It is important that the Medical Physicist know how to identify these changes and determine when a new treatment plan is needed to adapt for these changes.

This continuing education course will discuss commercially available dose measurement tools, phantoms, and techniques for performing acceptance testing, commissioning, and routine quality assurance for the IMRT and IGRT process. Types of commonly encountered errors will be discussed, with a special emphasis on the lessons learned and manpower requirements.

Educational Objectives:

1. To understand the issues surrounding IMRT and IGRT quality assurance
2. To identify potential sources of errors in IMRT and IGRT quality assurance
3. To review the tools used in IMRT and IGRT quality assurance
3. To understand the impact of target localization and patient positioning