

Purpose:

To describe the role of the Radiological Physics Center (RPC) in evaluating advanced technology radiation therapy.

Method and Materials:

The RPC was founded in 1968 under an agreement between the AAPM and the American College of Radiation Therapy Studies (CRTS). The agreement called for the AAPM to solicit applications to form a QA center that would bear the source in radiation dosimetry and physics for cooperative clinical trials for all radiotherapy facilities that deliver radiation treatment to patients entered into cooperative group protocols. The RPC has functioned continuously for 40 years to support medical physicists and radiation therapy departments.

Results:

The RPC's mission has changed only slightly over the years. The primary responsibility is to assure NCI and the cooperative groups that participating institutions have adequate quality assurance procedures and no major systematic dosimetry discrepancies, so that they can be expected to deliver radiation treatment safely and clinically comparable to those delivered by other institutions in the cooperative groups. To accomplish this, the RPC monitors the basic machine output and brachytherapy source strengths, the dosimetry data utilized by the institutions, the calculation algorithms used for treatment planning, and the institutions' quality control procedures. The methods of monitoring include on-site dosimetry by the RPC physicist, and availability of remote audit tools. During the on-site evaluation, the institution's physicist and radiation oncologists are interviewed, physical measurements are made on the therapy machines, dosimetry and quality assurance data are reviewed, and patient dose calculations are evaluated. The remote audit tools include 1) mailed dosimeters (TLD) evaluated on a periodic basis to verify output calibration and simple questionnaire to document changes in personnel, equipment, and dosimetry practices, 2) comparison of dosimetry data with RPC standard data to verify the compatibility of dosimetry data, 3) evaluation of reference and actual patient calculation to verify the validity of treatment planning algorithms, and 4) review of the institution's written quality assurance procedures and records. Mailable anthropomorphic phantoms are also used to verify the accuracy of every form of special treatment techniques. Any discrepancies identified by the RPC are pursued to help the institution find the origin of the discrepancy and identify and implement methods to resolve them.

The focus of this presentation is on the RPC's evaluation of advanced technology radiation therapy. The use of the RPC phantom has revealed a number of interesting conclusions about the delivery of IMRT and SBRT that should be understood by the community.

Conclusion:

While conducting these reviews, the RPC has amassed a large amount of data describing the dosimetry at participating institutions. Representative data from the monitoring programs will be discussed and examples will be presented to specify instances in which the RPC contributed to the reduction of dosimetry errors.

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Educational objectives:

1. Become familiar with the activities of the Radiological Physics Center.
2. Know how to contact the RPC for assistance or collaboration.
3. Understand the role of the RPC in monitoring institutions that participate in clinical trials.
4. Become familiar with the results of measurements in the RPC's anthropomorphic phantoms.
5. Review common errors and misconceptions regarding dosimetry, credentialing requirements, and other issues.