REPORT TO THE AAPM THERAPY PHYSICS COMMITTEE

Report No. 146

ADMINISTRATIVE

This is the last RPC report to the AAPM’s TPC after 45 years of reporting. Since the submission of the IROC grant, work to transition to the new National Clinical Trial Network and IROC has continued through weekly executive committee calls and monthly management committee calls. The IROC management committee will meet F2F at the Alliance meeting in early November. Since the last TPC meeting, the IROC grant submission Summary Statements were made available. The comments have been reviewed by the IROC PIs and adjustments to our initial proposals are being made to address reviewers concerns. The overall score for the grant was excellent and the score for the therapy component was even better. The first draft of the IROC Bylaws have been written and distributed to the IROC PIs for their review and comment. The IT subcommittee is working vigorously to have TRIAD in place and ready to be used by the trial participants, to have the IROC website up and running and to have identified an appropriate database to be used for IROC going forward. The relations subcommittee continues to work with the clinical trial groups and to promote IROC. Presentations regarding IROC were given at the last AAPM meeting, the ICMP meeting and will be given at RSNA. An article is being prepared to be submitted in the ASTRO newsletter. NCI expects to be able to inform us of our award amount this coming November 2013. The expected start date of this grant continues to be March 1, 2014. In the meantime the IROC QA centers have some transition funds for this calendar year that are being used to fund further meetings and some IT work such as website development, data transfer systems, improved electronic communications and facility databases.

Additional RPC Funded Efforts

Dept. of Veterans Affairs Contract

We are finishing the third year of a contract with the VA to provide QA audit services to all of their 38 VA radiotherapy centers. All of the site visits have been scheduled, all of the beams have been audited and they have either irradiated or are scheduled to irradiate one of the IMRT phantoms in the next couple of months. The RPC is currently working with the VA radiotherapy leadership (Mike
Hagan and Jatinder Palta) to initiate a second 3 year contract.

The RPC continues to be asked to provide its QA services for clinical trials conducted outside of North America. We are still monitoring nearly 250 radiotherapy sites in 46 countries. Many of these international sites are affiliated with the RTOG, COG or GOG. NCI is in full support of these international efforts as they increase accrual to clinical trials.

International Activities

1. Aids Malignancy Consortium Contract
2. ANZGOG Outback Trial Supplement
3. Korean GOG (KGOG) Cervical Cancer TACO Trial

Proton Therapy Site Approval MGH Federal Share Contract

The RPC has received funding support from MGH Federal Share funds for 2013 that includes a cost sharing mechanism. As such each new proton center will be invoiced a fee of $12,000 for each site visit. There are possibly 3 site visits that will be performed this calendar year. In addition, RPC staff is in communication with the physics staff at Heidelberg to visit them and learn about carbon ion therapy. They will take dosimeters to irradiate to see if we can set up and TLD/OSLD beam calibration audit program for carbon ions. The RPC also has funds to support efforts by NIST to establish a proton dose calibration standard.

RPC Staffing Changes

There are three personnel changes since the last report.

Travell Hollingsworth (Tech I) was hired in August to work in the OLSD group.

Cedrick Fountain (Administrative Clerk) was hired in August to work in the OLSD group and the administrative group.

John Costales (Machine and Fabrication Specialist) was hired in September to handle the audit tool repair, fabrications and modifications.

The RPC currently employs 6 medical physicists (2 PhD and 4 MS), 2.5 dosimetrists, 4 physics assistants, 5 OSLD/TLD technical staff, 3 IT support staff, and 6 administrative/data staff. This is the smallest number of physicists and dosimetrists that the RPC has ever had and the current funding will not support any expansion even though the workload (institutions, beams monitored and phantoms mailed) has increased nearly 40%. We continue to initiate new efficiencies to keep caught up with the workload.

The RPC graduated 4 MS physicists (one to defend early October) and have added 2 MS students and 1 PhD student. Currently we have 2 MS students and 8 PhD students funded by either the RPC, Dr. Followill or Dr. Kry's institutional research funds or Dr. Ibbott's chairman's/research funds. All of the projects are designed to enhance the RPC's dosimetry capabilities to verify the dose delivery/calculation at participating institutions.

STUDIES AND RESULTS

The RPC is aware of 3117 radiation therapy facilities worldwide (2691 in USA and Canada). The RPC currently monitors 2245 megavoltage therapy sites in North America and elsewhere in the world, that participate in cooperative group clinical trials funded by the NCI or collaborating with the NCI. The
cooperative groups monitored include ACOSOG, ACRIN, Alliance, AMC, CALGB, COG, ECOG, EORTC, GOG, JGOG, KGOR, ANZGOG, NABTT, NCCTG, NSABP, RTOG and SWOG. Today, nearly 126 EORTC members are taking advantage of the RPC’s remote audit programs.

The RPC currently provides QA monitoring services to nearly 250 radiotherapy facilities in 46 different countries outside of North America. This represents nearly a 70% increase in the number of international sites over the past 6 years.

**RPC QA Monitoring Activities:** The RPC continues to develop and provide QA services to institutions participating in NCI funded clinical trials as listed below.

a) **On-Site Dosimetry Reviews:** RPC physicists continue to make visits to North American study group members to conduct on-site dosimetry reviews. In 2013 to date, 31 radiotherapy sites (329 megavoltage photon, electron and proton beams) have been visited or have been scheduled for a visit. Since the RPC began in 1968, a total of 1773 site visits have been conducted by RPC physicists improving the practice of radiotherapy. Figure 2 shows the historical results of the percent of beams found to be within the RPC’s 3% criterion for reference machine output. Over the years, we believe that we have played a pivotal role in improving the dose delivery to radiotherapy patients.

b) **Visits to Proton Therapy Centers:** To date the RPC has made 15 visits to proton centers and has approved one or more treatment modalities at 10 proton centers for the use in NCI funded clinical trials. To date, 10 of the 13 active clinical trial sites have been approved to use one or more forms of proton therapy delivery in NCI funded clinical trials.

c) **OSLD/TLD:** The RPC has fully implemented the use of OSLD for its remote beam calibration audit program. We continue to monitor nearly ~14,000 beams per year with 10-15% of the institutions requiring a repeat. To date, since the RPC began in 1968, a total of 223,067 beam output audits have been performed by the RPC. OSLDs have been commissioned for proton beams but will not be used until the process is programmed within the RPC database. Until that time we will continue to use TLD. The $^{192}$Ir HDR brachytherapy OSLD remote audit tool and the single beam small field size output factor audit tool that were developed and piloted, have not been implemented yet as we are waiting for the machinist to build the audit phantoms. The single small field output factor audit phantom has been pilot tested at 5 institutions (R/I ratios all within 5% except for the 7.5 mm cone).

d) **VA Agreement:** We are at the end of the third year of the agreement with the Veterans Administration to provide remote audits and on-site dosimetry reviews to VA radiation therapy facilities. All 38 VA sites will have received OSLD beam checks annually, been site visited and irradiated the RPC phantoms by the end of this calendar year.
e) **Credentialing Processes:** The RPC participates in the credentialing of institutions for protocols involving advanced technologies including HDR brachytherapy, IMRT, stereotactic radiosurgery (SRS), stereotactic body radiation therapy (SBRT) and proton therapy. This activity is partially supported by a subcontract from the Advanced Technologies for Clinical Trials grant. Credentialing activities include, but not limited to, questionnaires, knowledge assessments, benchmark cases and phantom irradiations. In 2013 to date, 479 phantoms have been shipped all around the world, but mainly to sites in North America (Figure 4). The historical pass rate now is between 67% - 85% depending on the phantom. The pass rate for the IMRT phantoms for the past 2-3 years is between 85-90% with the exception of the liver phantom and spine phantom. We are using a gamma analysis for all phantom analyses. Since the beginning of the phantom audit program began back in 2000, a total of 3069 phantoms have been shipped and irradiated. This end-to-end audit has and continues to be one of the most important QA audits offered to the radiotherapy community.

![Figure 3. Number of phantoms shipped by year.](image)

f) **Assurance of Consistency of Clinical Trial Treatment Records:** In 2013 to date, individual protocol patient treatment records for 564 patients treated on GOG, NSABP, NCCTG, and RTOG protocols were evaluated. Of these, ~250 patients received either HDR or LDR brachytherapy treatments along with their external beam. The RPC continues to be the only QA center that performs extensive QA of the brachytherapy treatments for clinical trial patients.

g) **Facility Questionnaire (FQ):** The RPC implemented a web-based facility questionnaire to be used by all study groups and their participants. To date, the questionnaire has been sent to all participating radiotherapy centers. The RPC is updating the questionnaire to be more comprehensive and to share results with study groups and QA centers.

h) **Webpage:** The RPC webpage continues to be updated with a new look and with new features on a more frequent basis including news articles, publications and guidelines. Newsletter articles can be found on the website.

i) **Publications:** During this grant cycle, a total of 47 manuscripts have been published or accepted for publication and 10 more have been submitted and are in the review process.

### PUBLICATIONS AND ABSTRACTS

**Publications Accepted/Published (2011-present):**

47 total (23 as major author (*)/ 22 as 1st or 2nd author) Since the beginning of the RPC, a total of 274 publications have been published by staff at the RPC.


Submitted Manuscripts – 10 (8 as major author (*) / 8 as 1st or 2nd author)


3. *Pulliam KB, Followill SF, Court L, Dong L, Gillin MT, Prado K, Kry SF. A review of more than 13,000 patient-specific IMRT QA results. Submitted PMB.


6. *Lowenstein JR, Kry SF, Roll JE, Faught AM, Peterson IA, Followill DS. To plan or not to plan: is it necessary to plan each insertion in high-dose-rate brachytherapy for cervical cancer. Submitted Brachytherapy.


8. Mueller J, Vining DJ, Jones KA, Rong J, Followill DS, Johnson VE, Cody D. In-Vivo CT dosimetry during CT colonography. Accepted Am J Radiology.

9. *Grant RL, Summers PA, Neihart JL, Blatnica AP, Sahoo N, Gillin MT, Followill DS and *Ibbott GS. Relative stopping power measurements to aid in the design of anthropomorphic phantoms for proton radiotherapy. Submitted JACMP.

BOOK CHAPTERS


Respectfully submitted,

[Signature]

David S. Followill, Ph.D.