IROC Houston QA Center's Independent Peer Review Quality Assurance Program for the Veteran Affairs Radiotherapy Facilities

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Introduction

The Veteran Affairs (VA) Administration implemented in 2010 a quality assurance (QA) program for their radiotherapy (RT) facilities in order to provide high quality radiotherapy treatments to all veterans. The Imaging and Radiation Oncology Core Houston Quality Assurance Center (IROC-H) provides three audit services to the VA sites: External beam audits, end-to-end test through the use of anthropomorphic phantoms and on-site visits. This work describes the program and its finds after two 3 year cycles of services.

Methods and Material

The external beam audit service provided by IROC-H is design to check the output of all the beams available for clinical use at the institution. This system is based on the irradiation of OSLD nanodots in mini-phantoms. The audits are done annually and performed following IROC-H's standard procedures.
The IMRT head and neck, IMRT prostate, SRS head, SBRT Lung, spine and SBRT liver phantoms were sent to verify advanced radiotherapy delivery modalities. The phantom sent to the institution is imaged, planned and treated following instructions designed based on site specific protocols. The criteria used to evaluate the irradiation is the same as the one used to credential clinical trails participants.
During an on-site visit an IROC-H's physicist with a set of equipment travels to the VA-RT facility. Calibration of all beams is done following AAPM TG-51 protocol. Basic dose calculation parameters are verified (field size dependence including small fields, percentage depth dose, wedges and off axis ratios).

Methods and Material (cont'd)

Mechanical checks, MLC and IGRT test are performed. The QA program is evaluated based on APPM TG 40 and 142 guidelines. The final report of an on-site visit includes a section with recommendations over parameters that were found to be deficient or outside criteria.
Anthropomorphic phantoms and on-site visits are performed once during each 3 year cycle.

Results

The VA has 39 RT facilities. In 2010, 426 beam outputs were verified (photon and electron beams) with an average IROC/VA site ratio of 0.998 ± 0.021 (90% of the beams within 3%). In 2016 for 499 beams, the average was 1.001 ± 0.016 (95% of the beams within 3%). The number of beams outside the 5% criterion decreased from 4 to 1. See Fig. 1.

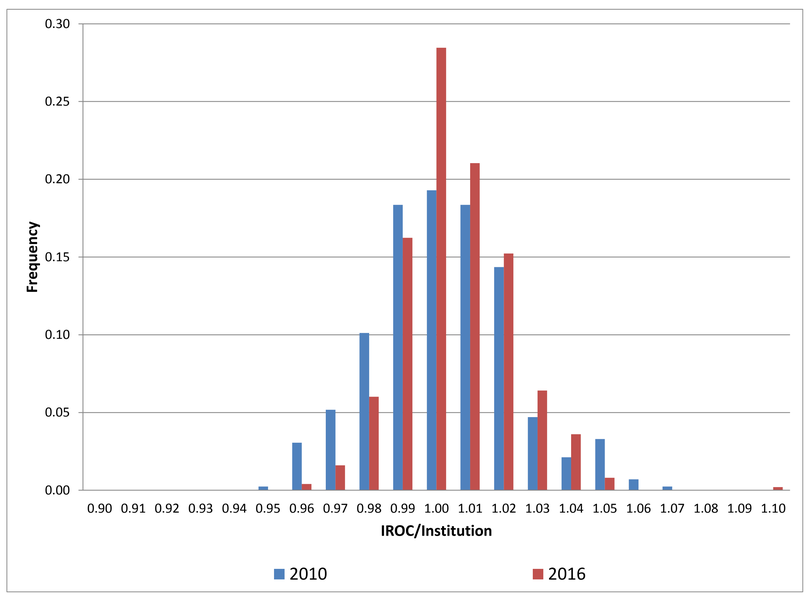

Figure 1: Histograms of results for the external beam audit.

During the first cycle, 70% of the irradiation were for IMRT phantoms, 2% SRS head and 28% for the SBRT phantoms During the second cycle 15% of the irradiations were IMRT phantoms and 85% for the SBRT and spine phantoms. The pass rate for phantoms was the same for the 1st and 2nd cycles(85 and 86% respectively), but the complexity of the phantom treatment increased.

Results (cont'd)

At the time of this study 93% of the VA RT facilities received a second on-site visit. On-site visit reports averaged 3 recommendations per institution during the 1st visit and 2 recommendations per report during the 2nd cycle. In general, RT facilities upgraded their RT equipment, delivery modalities and QA programs between visits. See Table 1.

Table 1: List of recommendations and percentage of institutions that received it during 1st or 2nd visit report (red numbers indicate less)

Recommendation	1st visit	2nd visit
QA program	80%	71%
Small Field	68%	66%
Wedge	24%	3%
Off axis	17%	21%
Photon calib.	7%	3%
Electron calib.	12%	3%
Photon PDD	12%	11%
Electron PDD	12%	13%
T/P corr	2%	0%
Dosimeter calib.	5%	3%
TPS model	2%	3%
Staff	5%	0%
Electron Cone	2%	0%
Symmetry	0%	5%
IGRT	0%	5%
Equipment	10%	13%
Documentation	5%	11%

Conclusions

There were noticeable improvements in the performance even with growing complexity in delivery capability at the VA RT facilities peer reviewed by IROC-H.

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