

## TROG 08.03 – RAVES

# Quality assurance and credentialing requirements for sites using inverse planned IMRT Techniques

### *Introduction*

Commissioning and quality assurance of planning systems and treatment delivery equipment for IMRT is complex. It requires consideration of issues such as small segments, dynamic treatments and the requirement for high accuracy in MLC leaf position. Furthermore, in the presence of high dose gradients, IMRT treatments demand extra precision in treatment delivery and careful attention to planning techniques that must be robust in the presence of inter (and intra-) fraction organ motion. In line with TROG policies, centres participating in the TROG 08.03 (RAVES) trial will be required to satisfactorily complete a credentialing and benchmarking exercise prior to patient recruitment. In addition, all trial patient treatment plans will be subject to QA procedures.

The QA procedures for sites using IMRT techniques are summarised below:

- **Facility Information:** All sites must first complete the Facility Questionnaire, including the section specifically related to IMRT techniques.
- **External Audit:** Sites must satisfactorily complete an external dosimetry audit (phantom study). Sites that have not yet completed an approved external IMRT dosimetry audit should contact the Coordinating Trial Centre as soon as possible to make arrangements for a site visit.
- **Submission of RAVES-specific case:** All clinicians must complete the contouring and planning benchmarking exercise prior to trial recruitment. For each site, at least one benchmarking case must be planned using an IMRT technique AND must be verified using the approved in-house IMRT dosimetry QA protocol. In addition to the plan, in-house dosimetry QA completed for the RAVES-specific case

needs to be submitted. This, for example, may include the results of ion chamber, MapCheck, EPID fluence map etc measurements usually carried out by physics staff.

- **Post trial activation:** QA reviews will be conducted for all trial patients who receive radiotherapy. The treatment plan for all trial patients planned using an IMRT technique must be verified using the in-house dosimetry QA protocol. The physics dosimetry QA report must be submitted with the plan for review.

### ***Pre-Trial QA: IMRT Credentialing***

Each centre shall participate in the following credentialing activities prior to accrual of patients into the trial. Credentialing shall include:

- Completion of a facility questionnaire that describes the centre's IMRT equipment, treatment plan verification techniques, and experience with IMRT and IGRT. It is expected that the physics staff routinely verify all IMRT treatment plans through:
  - Direct measurement of absolute dose in a clinically significant volume in a low dose gradient region, and;
  - A 2-dimensional relative dose distribution check at a number of points.

It is recognised that there are many different ways to verify that an IMRT treatment can be delivered as planned and as such the RAVES protocol is not specific in how the IMRT dosimetry QA should be carried out. We therefore ask the physics departments to provide protocols so that the in-house protocol can be assessed. The verification protocol shall state the action threshold, equipment used to verify treatment delivery (e.g. ion chamber, MapCheck, EPID), and process for measurement (e.g. if all fields are verified individually or as a single composite measurement of all fields). If these procedures are considered acceptable for this trial, the RAVES technical review committee will declare the in-house protocol as the "approved in-house verification protocol."

- Centres shall successfully complete a TROG-approved, generic benchmark credentialing activity (dosimetric) including verification of

dose via site visits with a phantom. The purpose of this external dosimetry audit (which is usually conducted by a visiting physicist or a mailed phantom from an internationally recognised dosimetry laboratory) is to confirm that each centre has appropriately commissioned their treatment planning computer(s) and linac(s), and have appropriate dosimetric QA methods in routine use. Centres shall demonstrate that they are able to deliver the treatment plan within 5% for each field and within 3% for the total composite dose. Relative dose measurements in a plane through the isocentre shall be within 5% or 3 mm distance to agreement for at least 95% of points in regions where the dose is greater than 10% of the maximum dose. ***Centres that have received credentialing to participate in the PROFIT study should submit the results of the PROFIT dosimetry audit to the RAVES technical committee for review.***

***Please note:*** Sites that have not participated in an external TROG-approved IMRT dosimetry audit should contact the Coordinating Trial Centre as soon as possible. Due to the expense of external audits, sites will need to demonstrate commitment to participating in RAVES before audits can be scheduled. This is defined as: 1) Submission of RAVES to Ethics; and 2) Submission of the Facility Questionnaire.

### ***Pre-Trial QA: Trial Specific Benchmarking Exercise***

All sites are required to successfully complete the RAVES benchmarking exercise before patient accrual can commence. Details may be found on the following website:

[http://www.trog-raves.org/HTMLPages/quality\\_assurance.htm](http://www.trog-raves.org/HTMLPages/quality_assurance.htm) See "Dry Run Program."

The aims of this exercise are as follows:

- Identify interpretation ambiguities of the protocol regarding variations in contouring methods;
- Identify interpretation ambiguities of the protocol regarding variations in planning methods, and;

- Collect planning data in electronic format for validation of the technical QA audit system.

Each treating clinician will be required to contour the CT dataset. A treatment planning exercise will be completed for each contoured CT dataset using the centres' usual inverse planning technique. If a centre is likely to use 3DCRT and IMRT techniques, then it is only necessary to submit one IMRT plan per centre (e.g. If a centre has 5 clinicians, it is acceptable to submit 4 plans using 3DCRT and 1 IMRT plan).

For sites that have already completed the benchmarking exercise using a 3DCRT technique, an IMRT plan may be created using the previously approved contours. **However**, the option to use a 0.5 cm posterior expansion to the PTV is NOT AVAILABLE when using IMRT. If the 3DCRT PTV used a reduced post margin, a new PTV with uniform 1 cm margin must be created and used for the IMRT plan.

Should major deviations be identified in the submitted benchmarking exercise, re-submission may be required. It is recognised that this could be a significant task if planned with an IMRT technique. Therefore the RAVES review team will on request carry out a preliminary review of the contours for the re-submission prior to planning.

In addition to completing the procedures outlined on the website, centres are also required to verify at least one of the IMRT treatment plans can be delivered using the approved in-house dosimetry QA verification protocol (i.e. measurements of absolute and relative dose, usually carried out by physics staff using for example, ion chambers, diode arrays, EPID etc). The results of the verification tests must be submitted with the benchmarking exercise.

### ***On-Trial QA: Patient Specific QA (Case Reviews)***

Treatment plans for all trial patients who receive radiotherapy will be subject to timely review as described in section 8.12.2 of the protocol. In addition to submitting the treatment plan, centres are required to provide

the results of the physics dosimetry QA measurements of absolute and relative dose.

## ***Planning Guidelines for IMRT***

### *Dose prescribing and reporting:*

To be consistent with the 3DCRT planned cases, it will still be necessary to *report* the dose to the ICRU 50 point. *Please note:* For IMRT, this point may be selected after the plan has been optimised and can be anywhere in the centre of the volume as long as it is clinically significant. The dose to the ICRU 50 point will be 64 Gy (TD). Typically we prescribe IMRT doses to a volume. To fulfil the needs of this trial the minimum isodose covering the PTV shall be  $\geq 95\%$  of the TD and for IMRT plans the dose may be prescribed as follows: the D100 (dose covering 100% of the PTV) shall be at least 95% of the TD.

### *Plan evaluation and posterior margin:*

All IMRT plans will undergo the same rigorous review as the 3DCRT plans. In addition, the following should be noted:

**The posterior margin shall be 1 cm for IMRT plans.** Whilst the protocol does allow a reduction to 0.5 cm to meet dose constraints where necessary for 3DCRT plans, it is expected that this compromise will not be needed for IMRT plans. This is particularly important in the presence of a steep dose gradient and when soft tissue imaging may not be available or considered inappropriate.

- It is expected that the mean dose to the PTV will be  $\pm 5\%$  of the prescribed dose.
- The maximum dose should be contained within the CTV, and must be contained within the volume bounded by the PTV.
- The dose outside the PTV will be minimised.

For further details contact the RAVES RT QA team:  
<http://www.trog-raves.org/HTMLPages/contacts.htm>  
or [RAVES.Therapist@petermac.org](mailto:RAVES.Therapist@petermac.org)