RTQA in clinical trials: Future needs

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Content

• The Global Harmonisation Group
• Harmonising RTQA in trials
• Future needs for prospective Individual Case Review
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The Global Harmonisation Group

Established in 2010, Goals:

• Collate, homogenise and distribute information regarding RTQA standards,

• Provide a platform for prospective discussions on new RTQA procedures, software tools,

• Provide a framework to endorse RTQA procedures across various trial groups.

Editorial

Radiation therapy quality assurance in clinical trials – Global harmonisation group

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Harmonising RTQA in trials

Why global cooperation and harmonization is needed:

• To create sufficiently large patient datasets within a reasonable period.

• To create broader acceptance of the trial results and thus the impact of the trial.

• Proper quality assurance of radiotherapy results in a stronger statistical power of trial result. Thus, fewer patients have to be accrued.
Harmonising RTQA in trials

What do the following procedures have in common?

• Benchmark case
• Dummy Run
• Rapid Review
• Pre-trial case review
• Data submission test
• Digital data integrity quality assurance
• Dry run

Melidis et al. IJROBP 90(5) 1242, 2014
Harmonising RTQA in trials

Current GHG projects:
• Endorsement of External Reference Dosimetry Audits
• Endorsement of IMRT/VMAT credentialing standards
Automated prospective ICR

EORTC Lungtech trial

• Stereotactic ablative radiotherapy (SABR) of inoperable centrally located NSCLC

• Phase II, non-randomized, single arm, multicenter trial

• Prospective ICR review (delineation and planning) for all accrued patients

• Time between submissions and review: 3 days

• Time for corrections: 3 days

4D-CT RT planning—using 3D FDG-PET/CT<sup>b</sup> co-matching

Image guided SBRT with CBCT verification 7.5 Gy × 8 fractions = 60 Gy

2-3 weeks

RTQA Central Review: delineation and treatment planning

Treatment plan confirmation will be sent via email to the site

Upload on EORTC Radiotherapy platform

Upload on EORTC Radiotherapy platform

RTQA Central Review (retrospective): treatment verification CBCT
Automated prospective ICR

<table>
<thead>
<tr>
<th>Atlas Development</th>
<th>Refine tolerance criteria</th>
<th>Apply auto-QART contour tool</th>
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</thead>
<tbody>
<tr>
<td>Benchmarking exercise with multiple data sets and observers</td>
<td>Limited data set</td>
<td>Complete data set</td>
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<tr>
<td>Generate Atlas based on benchmarking data</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Compare sensitivity and specificity of Auto-QART against manual review</td>
</tr>
</tbody>
</table>

Courtesy of Lois Holloway, University of New South Wales
Automated prospective ICR
Automated prospective ICR

VODCA - Data Verification Report

Verification Protocol : EORTC 0

Patient ID = RMH^LunaTech^08^MK^ / Patient Name = RMH^LunaTech^08^MK^ 

CT: "***":

⇒ Patient orientation = "L\P" ?
⇒ Patient orientation = "L\P"

CT: "***":

⇒ Number of slices > 50 ?
⇒ Number of slices = 167

= Meets Protocol  = Minor Variation  = Requires Attention
Automated prospective ICR

RD: "Serie1" - DVH: "SBRT-plan - Esophagus"

$V(D=40\text{Gy}) < 0.50 \text{ cc of the structure} \Rightarrow V(D=40\text{Gy}) = 0.00 \text{ cc}$
Automated prospective ICR

Santanam et al, IJROBP 2012

<table>
<thead>
<tr>
<th>Organ at risk name</th>
<th>Left/right</th>
<th>Margin (mm)</th>
<th>Proposed name</th>
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<td>Kidney_L_10</td>
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</tbody>
</table>
AAPM TG 263: Standardised naming

- Representation from IROC, NRG, IHE-RO, DICOM WG-7, ASTRO, EORTC, GHG and TPS vendors
- Started in 2014
- Aimed at broad acceptance and implementation
- Includes standardisation of DVH reporting, e.g., regarding volume segmentation
Standardizing structure nomenclature
RTQA of imaging: CT

ACR phantom for standard CT QA...
RTQA of imaging: 4D-CT

Respiratory correlated (4D)-CT
RTQA of imaging: 4D-CT

Respiratory correlated (4D)-CT

0%

mid ventilation

other phase
RTQA of imaging: 4D-CT

Respiratory correlated (4D)-CT
Stationary

mid ventilation

In trials: Need for standard image acquisition and processing protocols
RTQA of imaging: MRI

ACR phantom for standard MRI QA...
RTQA of imaging: MRI

In trials: Need for standard image acquisition and processing protocols

3D FLAIR | DTI | 3D T1-W | rs-fMRI | SWI

White matter lesions | White matter microstructure | Gray matter volume e.g. hippocampus | Brain networks Connectivity | Microbleeds

Courtesy from M de Ruiter and S Deprez, NKI-AvL
RTQA of imaging: MRI

Fully automated segmentation

Courtesy from M de Ruiter and S Deprez, NKI-AvL
RTQA of imaging: PET-CT

DOI 10.1007/s00259-009-1297-4

GUIDELINES

FDG PET and PET/CT: EANM procedure guidelines for tumour PET imaging: version 1.0
RTQA of imaging: 4D PET-CT

Transversal    Coronal    Sagittal

In trials: Need for standard image acquisition and processing protocols
“HOW ARE YOU DOING ON YOUR SIDE?”
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