International collaborations; audit groups working together

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RTTQA Radiotherapy Trials QA

Background

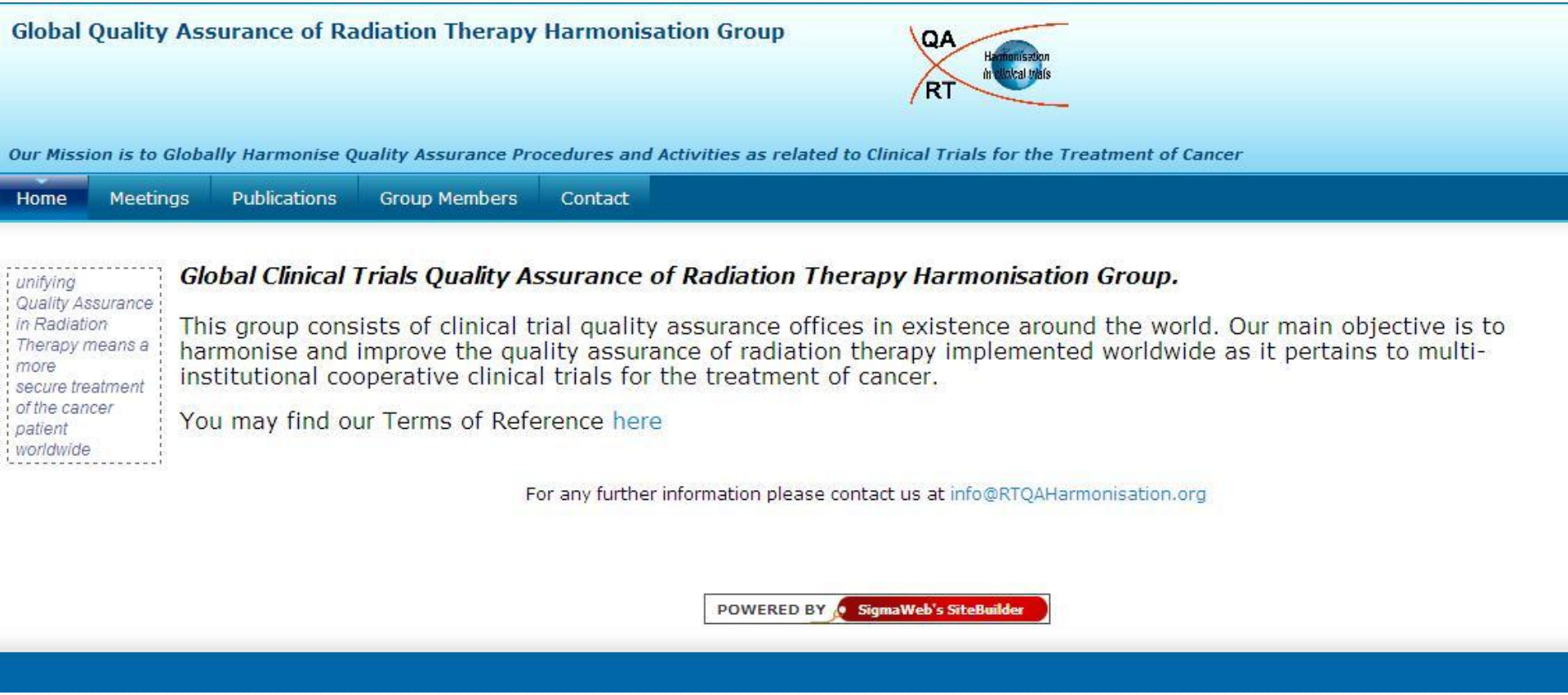
- Historically UK has been relatively independent of the rest of the world in audit
- NPL – PSDL
  - International intercomparison for reference dosimetry
- National audits
  - Photons, Electrons, IMRT, Rotational IMRT
- RTTQA UK Trials Group
  - NCRI portfolio
- IPEM
  - UK interdepartmental
- Relatively few links with other audit activity around the world

International setting

- More recently clinical trials, in particular for more rare diseases or difficult to recruit to trials, have become international
- European funding for standards labs with projects becoming more clinically relevant
- IAEA initiative to support audit networks and develop audit in less developed parts of the world

Global Harmonisation Group

- www.rtqaharmonisation.org



Global Harmonisation Group

- Our main objective is to **harmonise** and **improve the quality assurance** of radiation therapy implemented worldwide as it pertains to multi-institutional cooperative clinical trials for the treatment of cancer.

GHG Vision

- Many national and international clinical trials involve radiotherapy are conducted worldwide.
- Growing demand for collaboration between different groups conducting these trials for the following reasons.
  - For some diseases, international cooperation is required for sufficient patient accrual to achieve adequate statistical power. Expanding the patient population can provide a selection of patients within a narrower band of genomic subtypes.
  - Broader acceptance of the trial results and thus the impact of the trial can be achieved.
  - Several publications suggest that appropriate quality assurance of radiotherapy results in stronger statistical power of the trial results.

GHG Vision

- Approaches to radiotherapy and radiotherapy QA for multi-institutional clinical trials have been developed independently throughout regions of the world.

- By harmonising these approaches, international collaboration of clinical trials involving radiotherapy by various trial groups can be significantly enhanced.

- RTTQA is a member of the steering group of GHG

Radiotherapy Trials QA

GHG Strategy

- **Harmonisation Group goals and strategy**

1) Bring together, homogenize and distribute information regarding the quality assurance of radiation therapy (QART) standards of various trial groups in clinical trials.

2) Provide a platform for prospective discussions on new QART levels, software tools, guidelines and policies of trial groups.

3) Provide a framework to endorse existing and future QART levels and guidelines between various trial groups. Each organisation will be able to specify which QART procedures from other organisations they endorse and thus accept for future collaborative trials.

GHG meetings

- Launched in 2009
- Annual face-to-face meetings
  - Usually at ESTRO, ICCR etc
- Regular TC

GHG projects

- **Projects**
- Standardised naming conventions
- Gamma analysis comparison
- Audit report template

- **Future**
- Dosimetry intercomparisons

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www.redjournal.org

Physics Contribution

Standardizing Naming Conventions in Radiation Oncology

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GHG nomenclature project

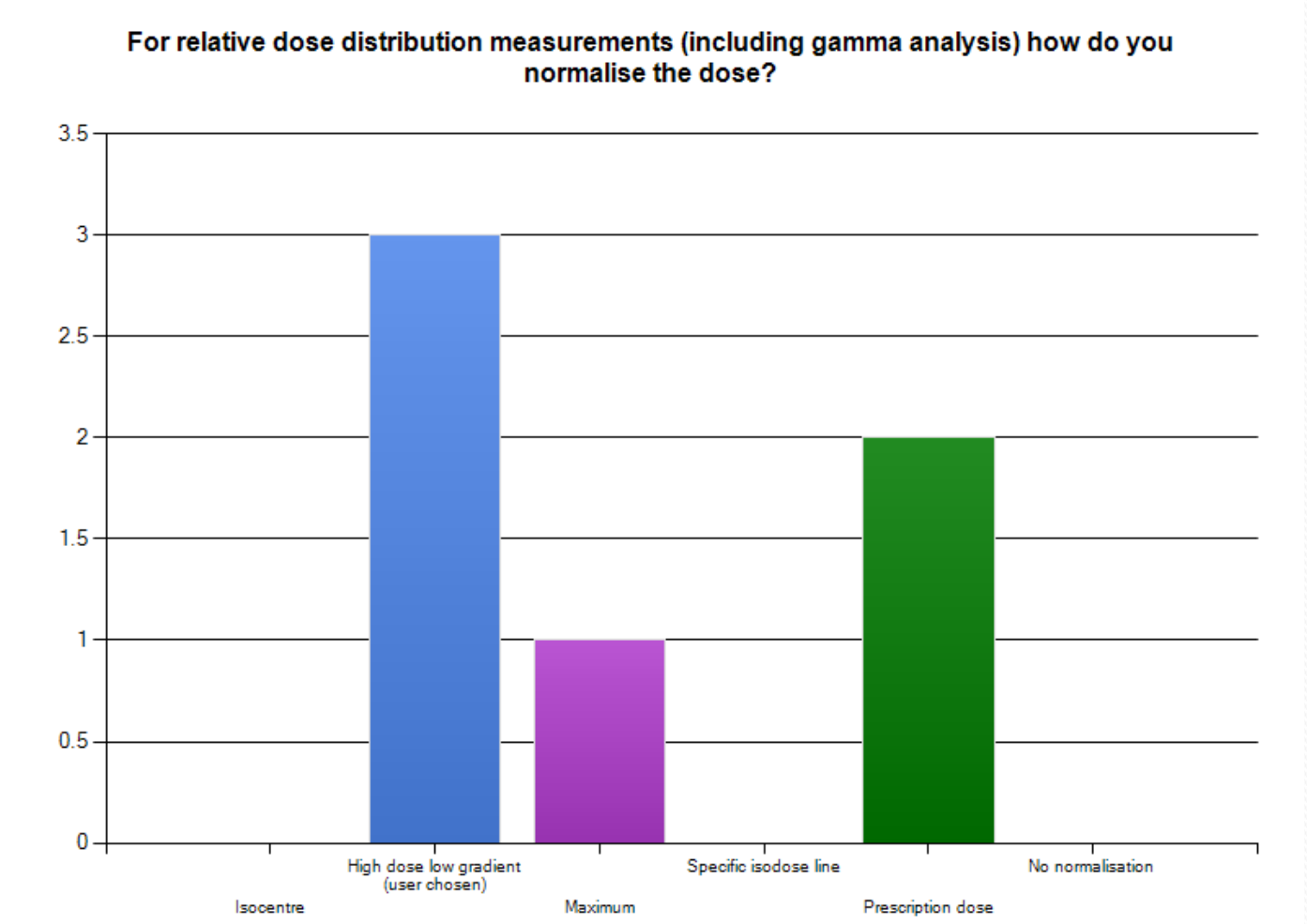
- Naming convention for terminology used in clinical trial QA groups
- Pre-trial, pre-accrual and during treatment
- Surveyed all current terms
- Condensed down to 11 standardised terms

Naming Convention Categories	Current Name	New Name
Baseline	Facility Questionnaire	Facility Questionnaire
	External Reference Dosimetry Audit	Beam Output Audit
	OSLD/TLD Beam Output Audit Reference Beam Output	
Pre-accrual	Benchmark Case by RPC	Benchmark Case*
	Dry Run by ITC and TROG	
	Dummy Run by EORTC-ROG, JCOG and RTOG	
	Outlining and planning cases/exercises	
	Digital Data Integrity Quality Assurance	Dummy Run (Without Delineation Exercise)
	Dry Run by RTOG	
	Data Submission Test	
	Benchmark Case by EORTC-ROG, IAEA and TROG	Dummy Run (With Delineation Exercise)
	Pre-trial Case Review Rapid Review	
	Credentialing for Advanced Technology Clinical Trials	Complex Treatment Dosimetry Check
	Complex Dosimetry Check	
	Credentialing for Advanced Techniques	
	Virtual Phantom Procedure	Virtual Phantom
During treatment/retrospective	Completeness Check, Basic Archiving, Compute Dose-Volume Histograms, Reconcile Structures and Image Registration by ATC	(Prospective or Retrospective) Individual Case Review
	Individual Case Review	
	Timely Review	
	Review of Patients' Treatment Records	Review of Patients' Treatment Records
	Case Report Forms	Case Report Forms
	On-Site Dosimetry Review Visit	Protocol Compliance and Dosimetry Site

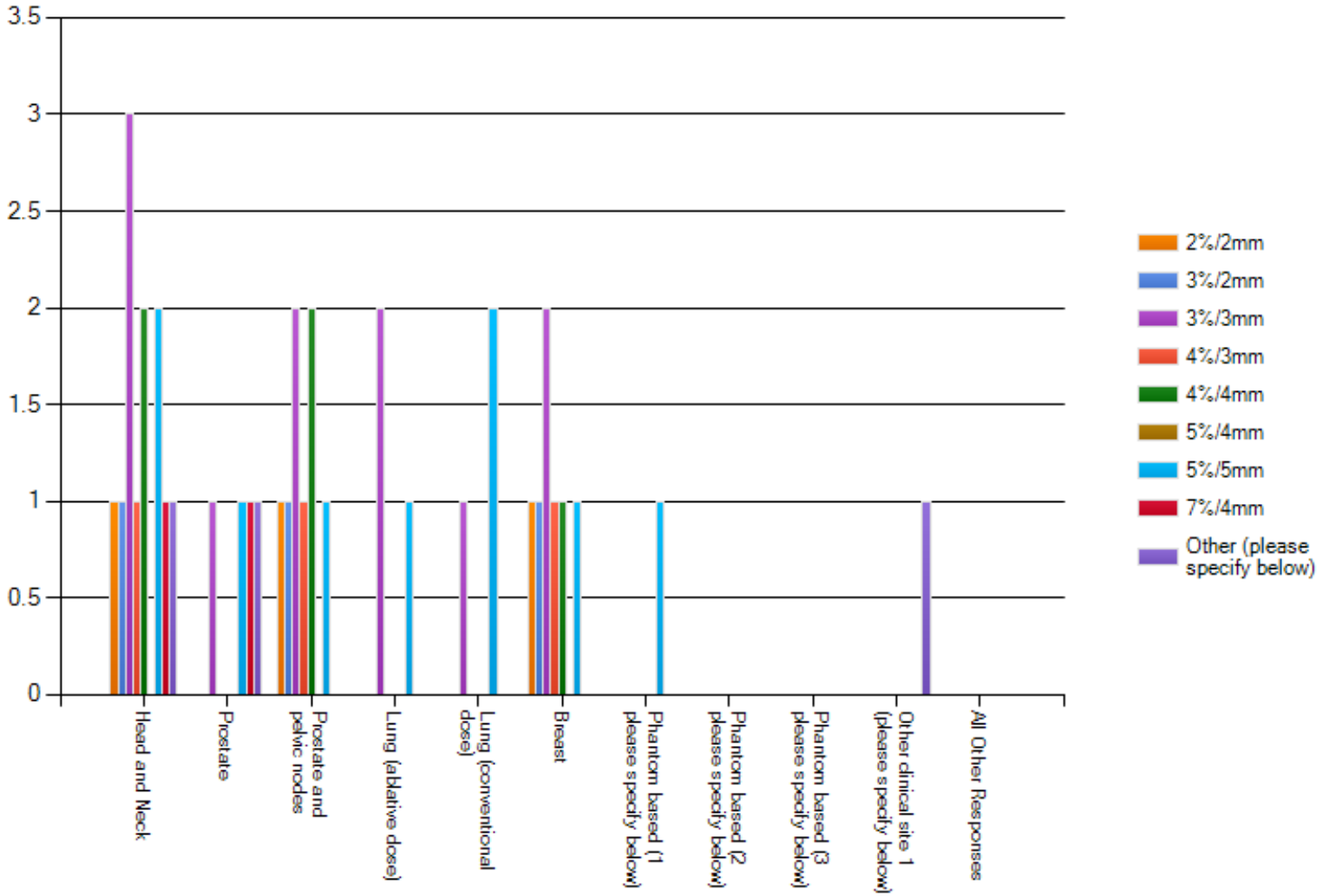
GHG gamma analysis project

- Survey on use of gamma analysis in clinical trial QA amongst the member groups of GHG
  - EORTC (Europe)
  - TROG, ACDS (Australia)
  - RPC ,RTOG, QARC (USA)
  - JCOG (Japan)
  - RTTQA (UK)
- A large range of approaches

GHG gamma analysis project



What are your gamma parameter tolerances for specific sites?(this may also be trial dependent, if so please comment)



GHG report template project

- Final question of the gamma analysis survey was what did each group think should be included in a trials QA report
- Agreement that should aim to use same terminology and same generalised format for reports
- Facilitate understanding and interpretation of each others reports
- Report template

Named personnel	**100.0%**	**6**
Signature of responsible physicist	83.3%	5
Phantom used	**100.0%**	**6**
Detector used	**100.0%**	**6**
Analysis software used	83.3%	5
Reference dose details (e.g output under reference conditions)	66.7%	4
Details of traceability of dosimetry to national (primary) standard	50.0%	3
Details of plan measured	50.0%	3
Details of points measured (e.g. low/high dose or low/high gradient)	66.7%	4
Details of position of points measured (e.g. in Primary PTV / spinal cord)	83.3%	5
Gamma details (see next question)	**100.0%**	**6**

GHG report template project

- Template has been proposed by RTTQA

- Treatment planning
- Measurement methods
  - Traceability
  - Calibration
  - Dose point / dose distribution measdurement
- Analysis approach
- Results

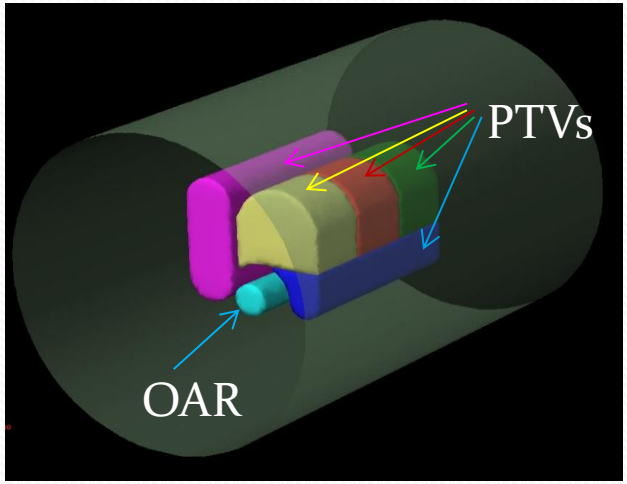
GHG report template project

- Needs to be made more general for international use because it follows UK dosimetry protocols, whereas most of the world uses IAEA and AAPM protocols.
- Such a form is useful for on-site visits but needs to be adapted to include audits based on mailed dosimetry.
- Merge with IAEA TecDoc 1543 (QUATRO)
- Report on a treatment planning review visit to a radiotherapy hospital
- Questionnaire
- Expert review

National Rotational RT Audit

- TROG
- Use of the 3DTPS test
- Able to compare with our data
- Consider whether they need a full national audit / credentialing measurements by comparing with local QA data

- EORTC
- Dutch IMRT group



Tsang et al. Br J Radiol. 2013 Feb;86(1022)

NPL International collaborations

- PSDLs intercomparisons for reference dosimetry
- One of first groups to have clinical linac
- Other PSDLs and SSDLs now doing the same
- More clinically relevant audit
- Potential for Standards labs to work together on audit approaches

NPL International collaborations

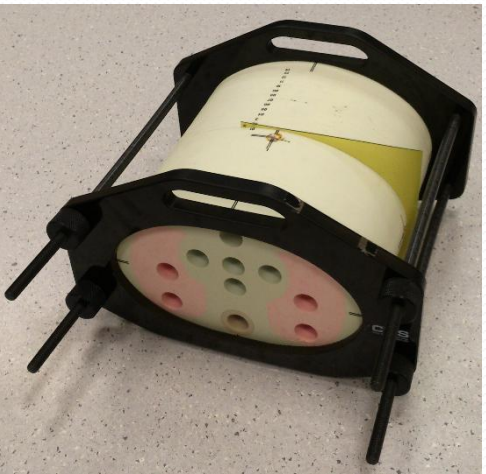
- European Metrology Research Project
- MetrExtRT
  - Metrology for Radiotherapy Using Complex Radiation Fields
- www.radiotherapy-emrp.eu
- Three-year project aiming to improve the metrology of ionizing radiation in external beam radiotherapy and brachytherapy.

NPL International collaborations

- **WP 1** "Develop and compare new references in term of absorbed dose to water for medium x-ray energies”
- **WP2** “Study new integral quantities for the characterisation of high energy x-rays .....including ...transfer methods in static and dynamic modes related to treatment conditions”
- **WP3** “Improve the consistency and traceability of proton and carbon ion beams, in particular novel types such as scanned particle beams”
- **WP4** “The use of low energy x-rays for brachytherapy”

NPL International collaborations

- **WP5&6** *"Develop traceable measurement systems for the verification of dose and distribution in complex radiation fields with strong variations of dose and small fields"*
- On site pilot dosimetry audit of clinical rotational IMRT dose distributions using anthropomorphic phantoms and a combination of radio chromic film and point-like detectors
- Linked to UK SABR Consortium Audit



SABR UK Consortium

IAEA

International meeting on Dosimetry Audit Networks (16-18 Dec 2013)

- **Quality and safety in radiotherapy**
- **Dosimetry audit networks: organizational and practical aspects.**
- **Experiences of national dosimetry audit networks. End-to-end audit systems: methodology and results**
- **Auditing complex techniques.**
- **What is QUATRO?**
- *Quality Assurance Team for Radiation Oncology. Beyond radiation dosimetry it is necessary to ensure that the clinical infrastructure (equipment and people) and clinical processes are adequate to provide quality radiotherapy.*
- **Physics on-site and internal audits.**
- **International perspective.**
- *How can we work together, share experiences and become more efficient*

Australian Clinical Dosimetry Service

- http://www.arpansa.gov.au/services/ACDS/index.cfm
- Provides an integrated national approach to promoting safety and quality in radiotherapy
- Provides local Medical Physics specialists with a source of independent checks for equipment and patient doses.
- Also helps to maintain the quality of radiotherapy in Australia, and provides a national approach to radiation measurements, making radiotherapy more consistent across the country and safer for patients.
- Collaboration with TROG

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Australian Clinical Dosimetry Service

- Level I: An independent measurement of linear accelerator output at one point under reproducible reference conditions in a regular rigid homogenous phantom.
- Level Ib: A more accurate independent measurement than the Level I audit, the Level Ib audit involves the ACDS visiting the requesting organisation and performing on-site measurements.
- Level II: An independent measurement of linear accelerator output at multiple points in multiple beams with increasing complexity.
- Level III: An independent end-to-end assessment simulating a patient's treatment path using a synthetic human upper torso in the place of a patient.

Future

- More recruitment into international trials
- More need for international trial QA
- More collaboration between trial groups to develop audit
- Dosimetry Audit Networks to facilitate collaboration both nationally and internationally