

Riunione Nazionale FIL
Padova, 8-10 Novembre 2012

Quality Assurance in Radiotherapy

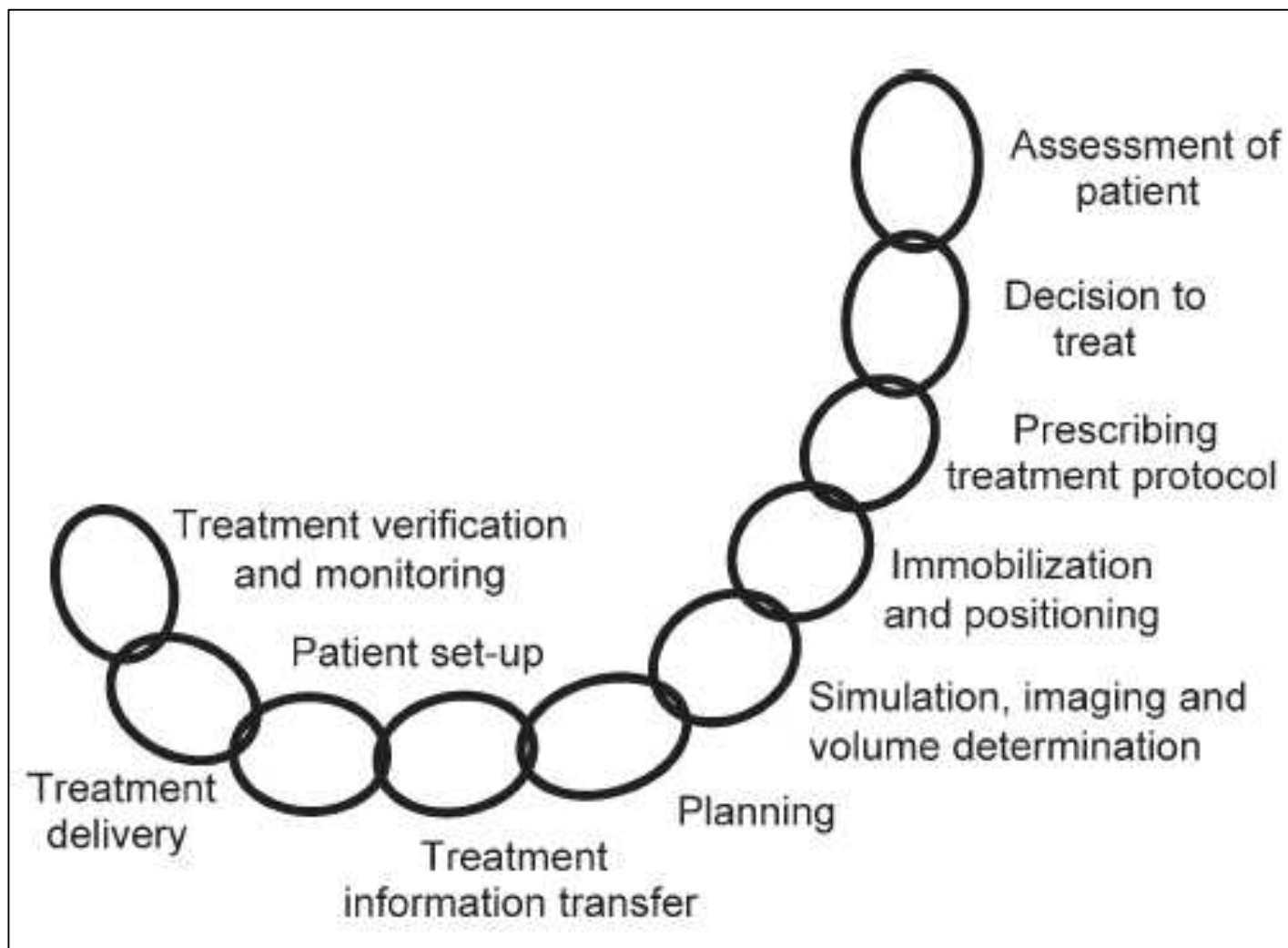


Patrizia Ciammella

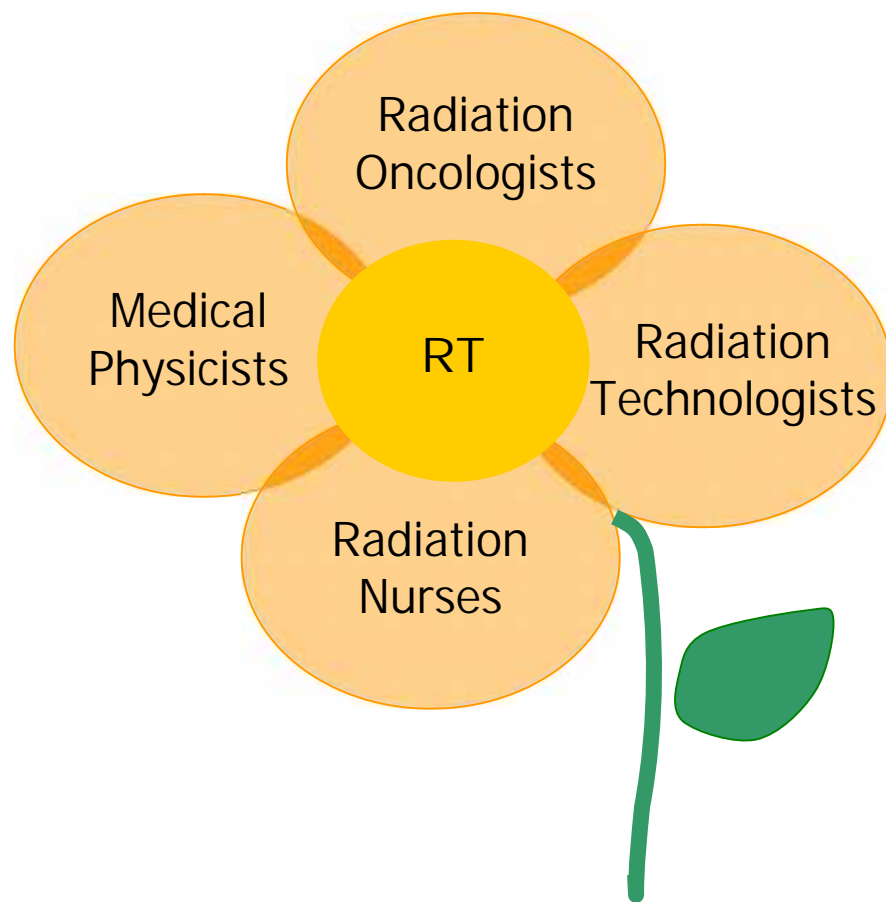
Arcispedale Santa Maria Nuova

Reggio Emilia

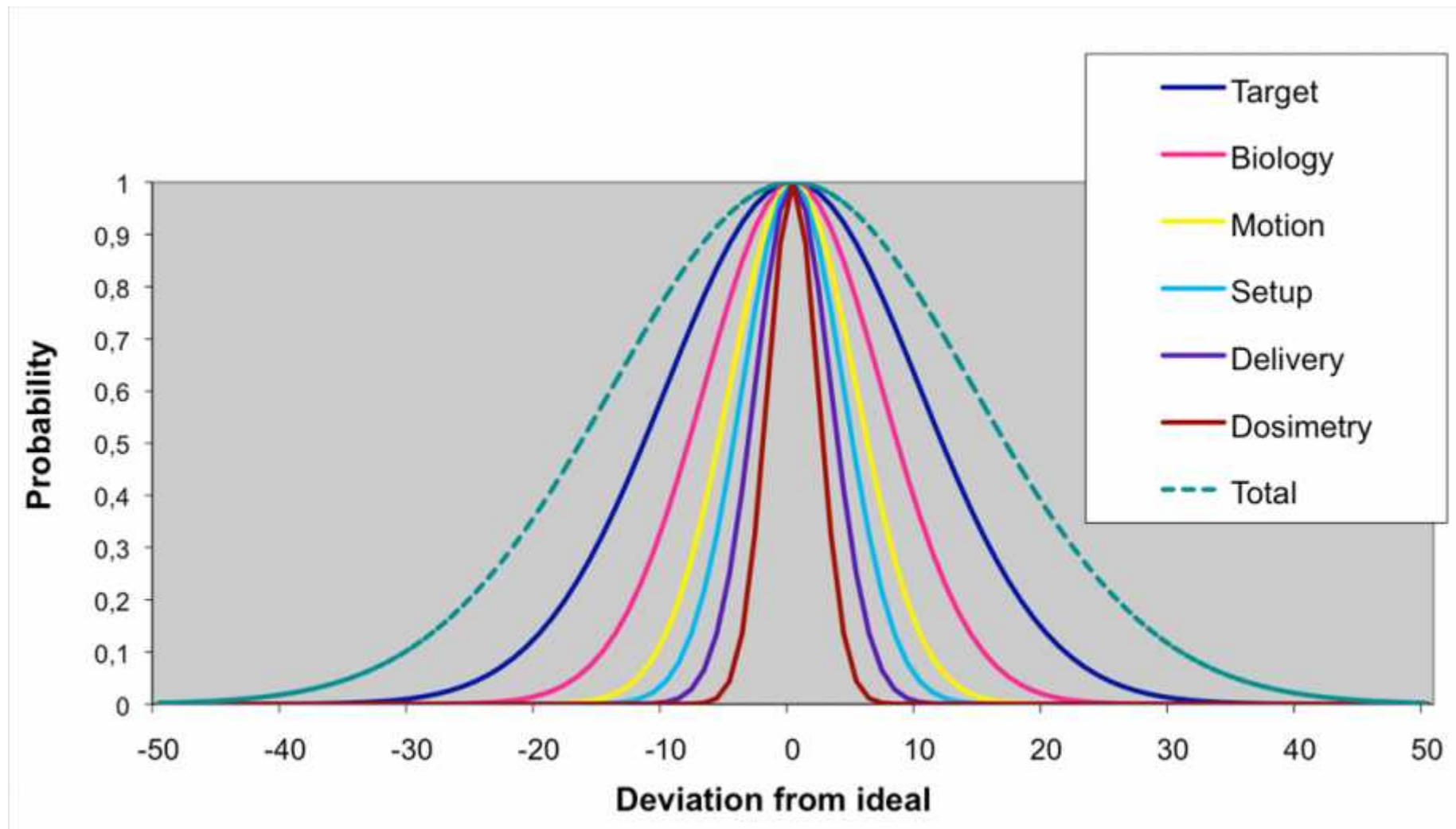
RT process



RT team



Residual treatment uncertainties



Philosophy of radiotherapy quality assurance

Scope of quality assurance protocols

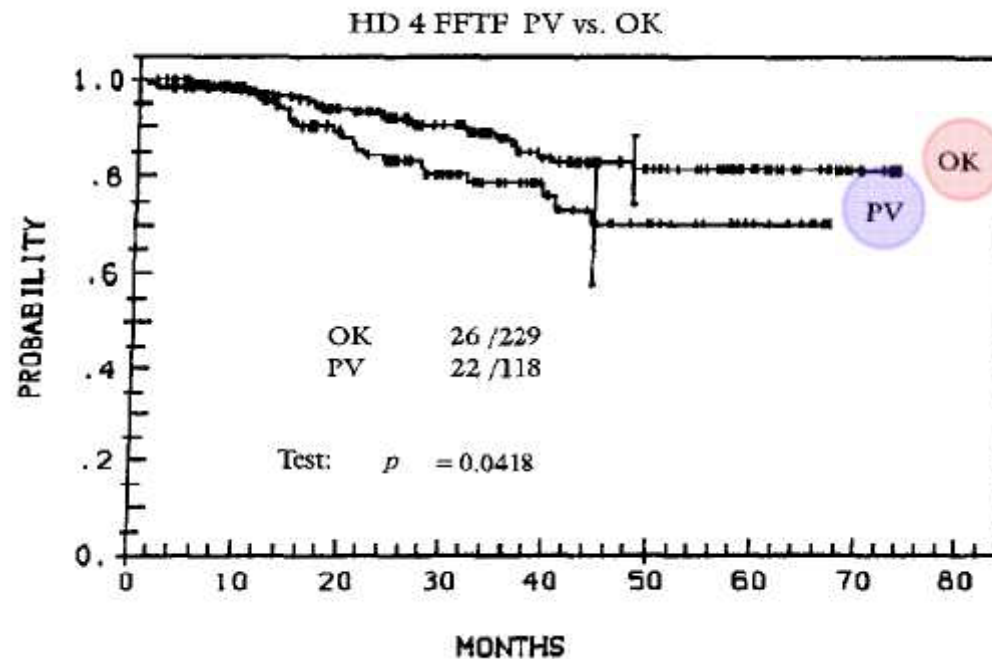


- guarantee the validity of clinical trial results
- improve the quality of clinical practice minimising the risk of errors
- increase the likelihood of desired health outcomes at the population level (equality of access, consistency, etc)

Importance of QA protocols

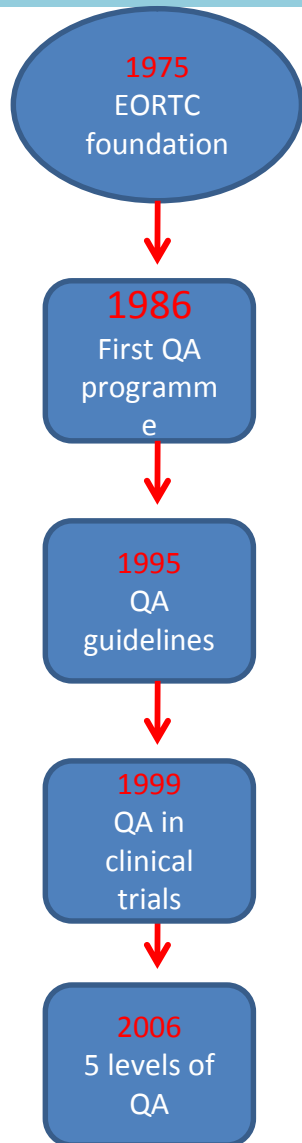
● *Clinical Original Contribution*

RANDOMIZED TRIAL WITH EARLY-STAGE HODGKIN'S DISEASE TESTING 30 GY VS. 40 GY EXTENDED FIELD RADIOTHERAPY ALONE



5-years FFTF was significantly influenced by the quality of radiotherapeutical procedures:
70% with protocol violations (PV) vs. 82% without PV

Quality assurance in radiotherapy



QA strategy of the EORTC Radiation Oncology Group (ROG)

1982-2005

- Site visits
- Evaluation of institutions' staff and infrastructure
- Dosimetric checks of treatment units
- Cross-check of patients charts and portal images
- Radiobiological modelling of inter-institutional differences
- Mailed thermoluminescent dosimetry audits

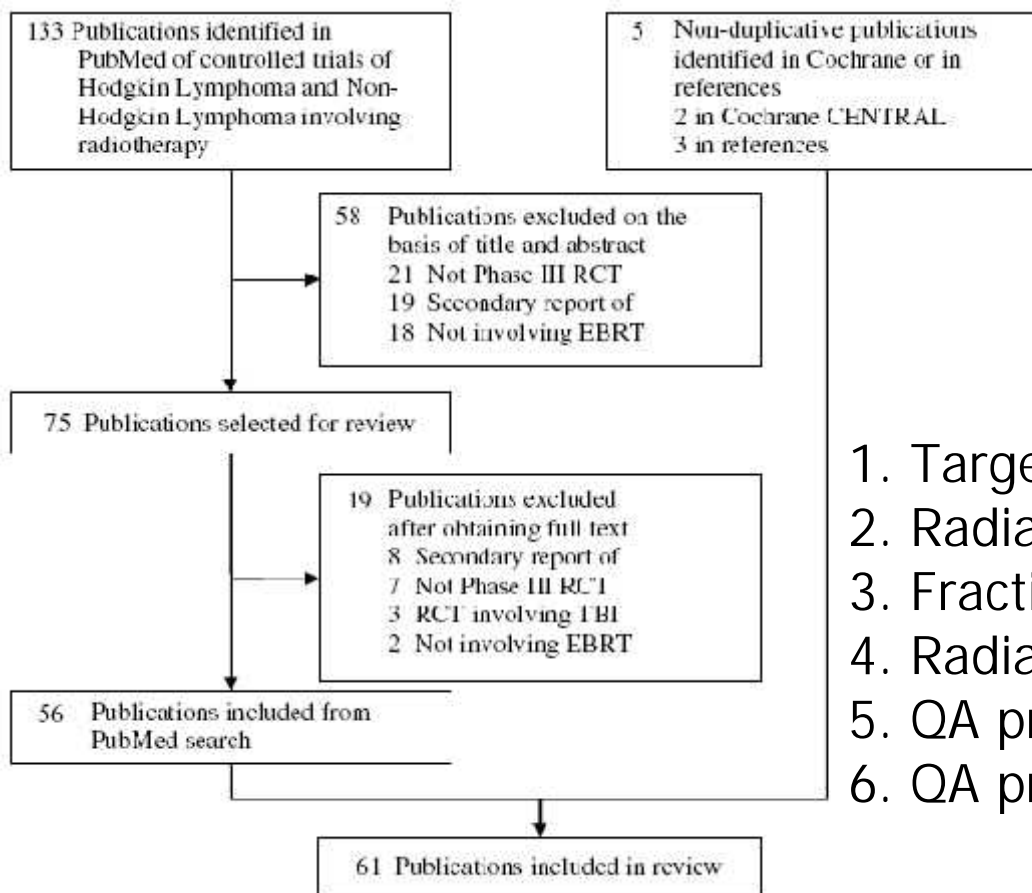
2005-2011

- Level 1: Facility questionnaire, External reference dosimetry audit
- Level 2: Dummy run
- Level 3: Limited individual case Review
- Level 4: Extensive individual case Review
- Level 5: Complex dosimetry check

QUALITY OF RADIOTHERAPY REPORTING IN RANDOMIZED CONTROLLED TRIALS OF HODGKIN'S LYMPHOMA AND NON-HODGKIN'S LYMPHOMA: A SYSTEMATIC REVIEW

JUSTIN E. BEKELMAN, M.D.,* AND JOACHIM YAHALOM, M.D.*

Int. J. Radiation Oncology Biol. Phys., Vol. 73, No. 2, pp. 492-498, 2009
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 0360-3016/09/\$-see front matter



Quality Measures

1. Target volume definition
2. Radiation dose specification
3. Fractionation specification
4. Radiation prescription point specification
5. QA process use for RT
6. QA process adherence reporting for RT

Radiotherapy reporting quality

Measures of radiotherapy reporting	Adequacy of reporting	
	<i>n</i>	%
1. Target volume description	23	38
2. Radiation dose specification	54	89
3. Fractionation specification	39	64
4. Radiation prescription point specification	13	21
5. Quality assurance process use	12	20
6. Quality assurance process adherence reporting*	7	11

Reporting of RT in HL and NHL RCTs is **deficient**. Because the interpretation, replication, and application of RCT results depend on adequate description and QA of therapeutic interventions, consensus standards for RT reporting should be developed and integrated into the peer-review process.

Quality assurance in radiotherapy

In the last years radiation oncology is undergoing a rapid and radical transformation driving an exponential growth in the size, complexity, and quantity of data generated during the treatment process.

The increase is due, in part, to the success of image-guided oncology programs, which generate new images at each step in the treatment process — from diagnosis to verification, up to follow-up.

Modern QA → digital data exchange
and timely review

Main system requirements

Task	Parameters
General	<ul style="list-style-type: none">• Network reliability in terms of up-time and fidelity of data transfer• Avoidance of local hardware and software installation• Web-based accessibility from any geographic location• Intuitive functionally evaluation tools• Uniformity of data submission procedures for all trials• Adequate firewall security• Central storage and archiving in a queryable database
Submission from centres to QART office	<ul style="list-style-type: none">• Ability to upload operating-system independent• Reads in digital data (DICOM-RT) exported from multiple TPS
Central evaluation	<ul style="list-style-type: none">• Document assessment of RT plan via a web-based evaluation matrix, standardize to facilitate consensus-building

A scenario for a web-based radiotherapy treatment planning system

Patients benefit

- Accessibility of advanced radiotherapy treatment services, minimising patient's transportation

Physicians benefit

- Consultation of expert colleagues
- Cooperation with reduce professional isolation

Organisations benefit

- Quality assurance in terms of dummy-runs and/or check of a real-patient treatment planning
- Minimisation of local-audits and the cost of on-site visit
- Evaluation and correlation of treatment outcome with radiotherapy parameters

RTQA platforms used by RTOG, EORTC or TROG:

- VodcaRT from Medical Software Solutions
- CERR software
- ITC remote review tool
- VelocityAI from Velocity Medical Solutions
- Mim software from Mimvista
- Artiview from Aquilab
- Swan
- (Widen)



- 2008: retrospective test
- 2009: prospective test
- 2010: currently utilize to QART procedures on ongoing EORTC trials

VODCA



Visualisation and Organisation of Data for Cancer Analysis

has been created to ...

- ➔ Promote in radiotherapy clinical decision-support and knowledge management technologies in patient care and clinical research;
- ➔ Disseminate methods and tools for building healthcare knowledge applications that comply with the highest quality, safety and ethical standards;
- ➔ Connect individuals, hospitals, research groups and organisations who believe in the value of knowledge management, and support the share and reuse of clinical knowledge and data.

“Prospective quality assurance program and development of an Italian network for radiotherapy in patients affected by lymphoma enrolled in the clinical trials”



Proof of Concept (POC)

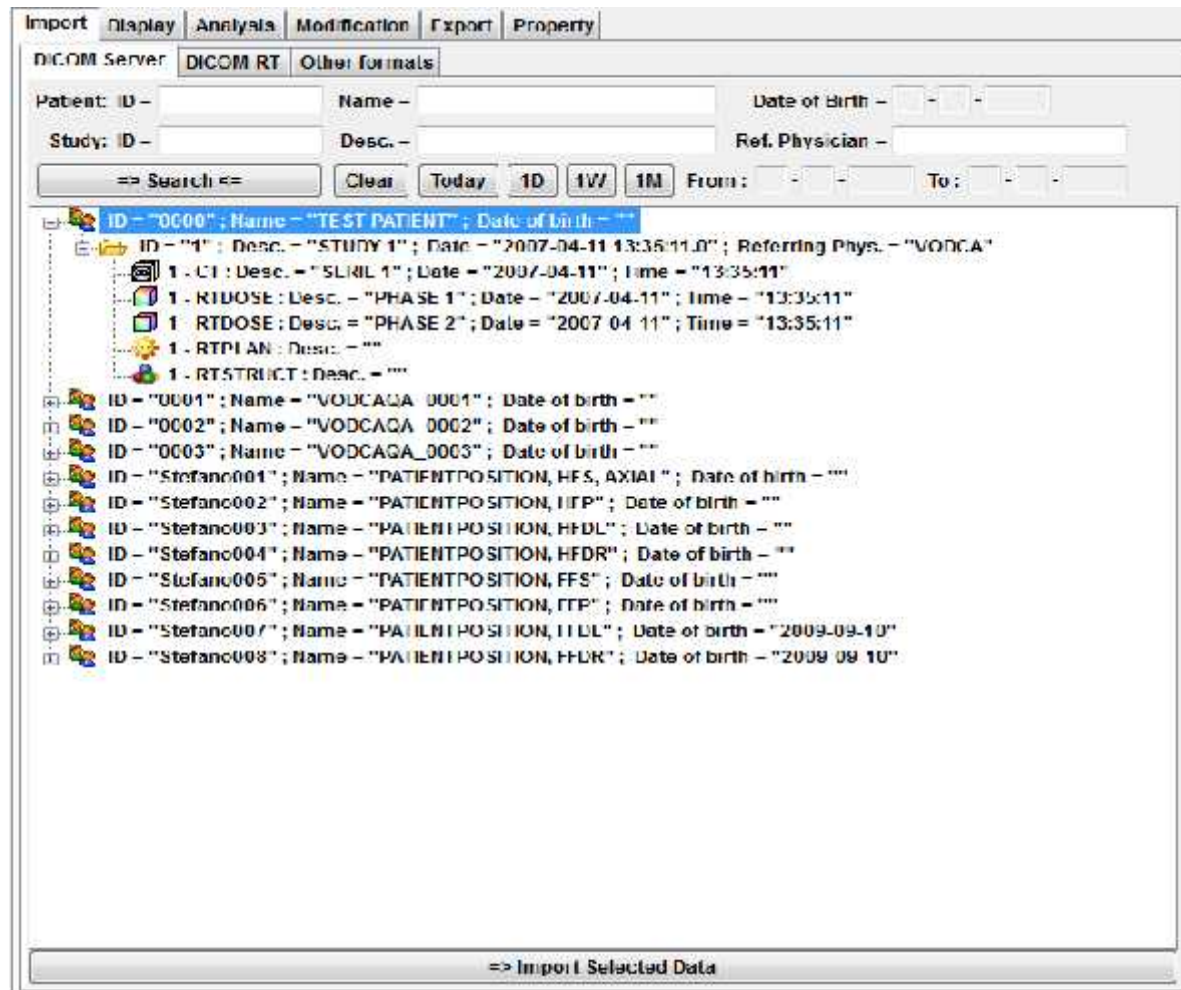
- 6 RT centres
- July-September 2012
- HL patients

VODCA

- VODCA Control



- VODCA DICOM Server



VODCA

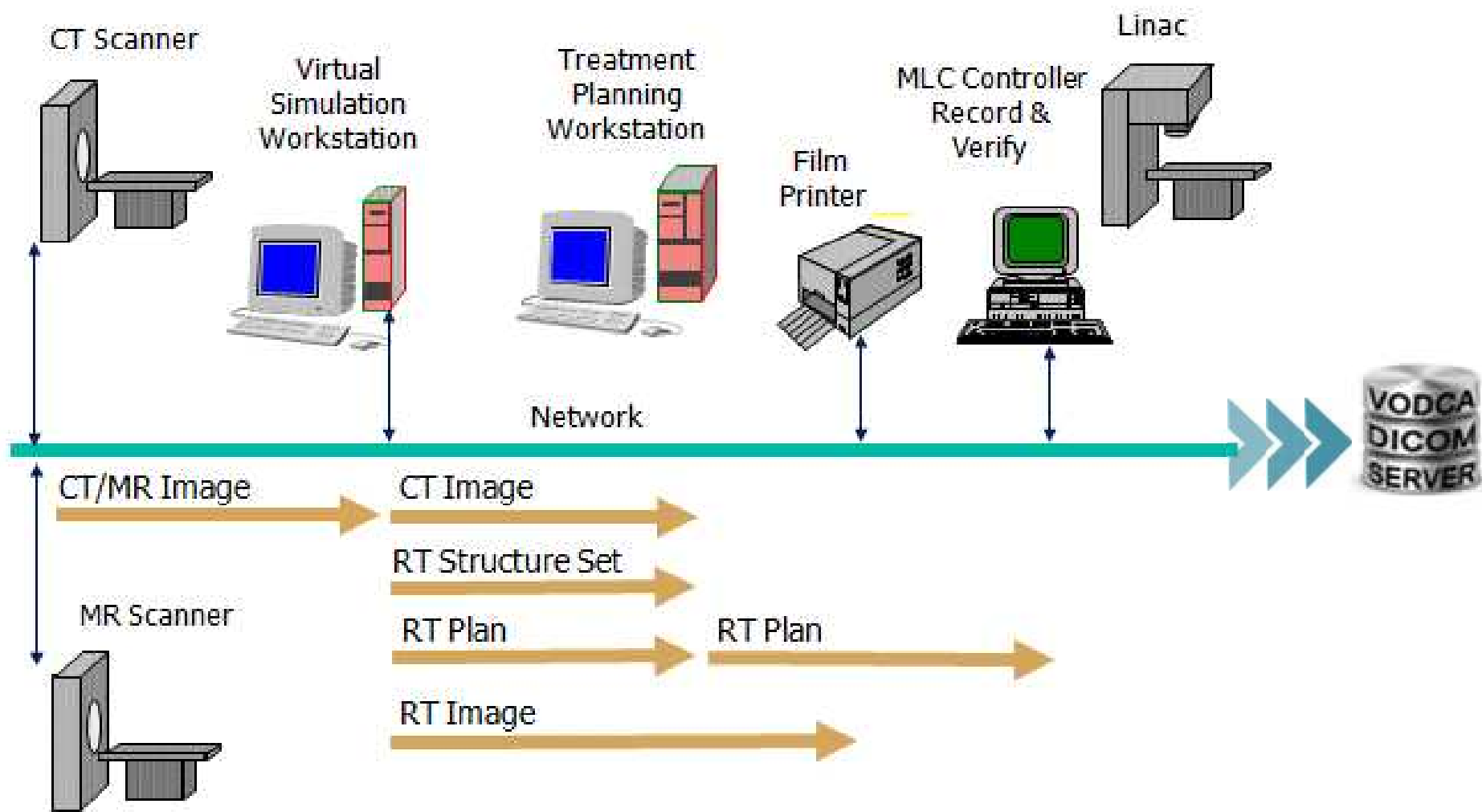
- Databases

Every patient dataset has an unlimited amount of user defined fields subdivided into 3 categories:

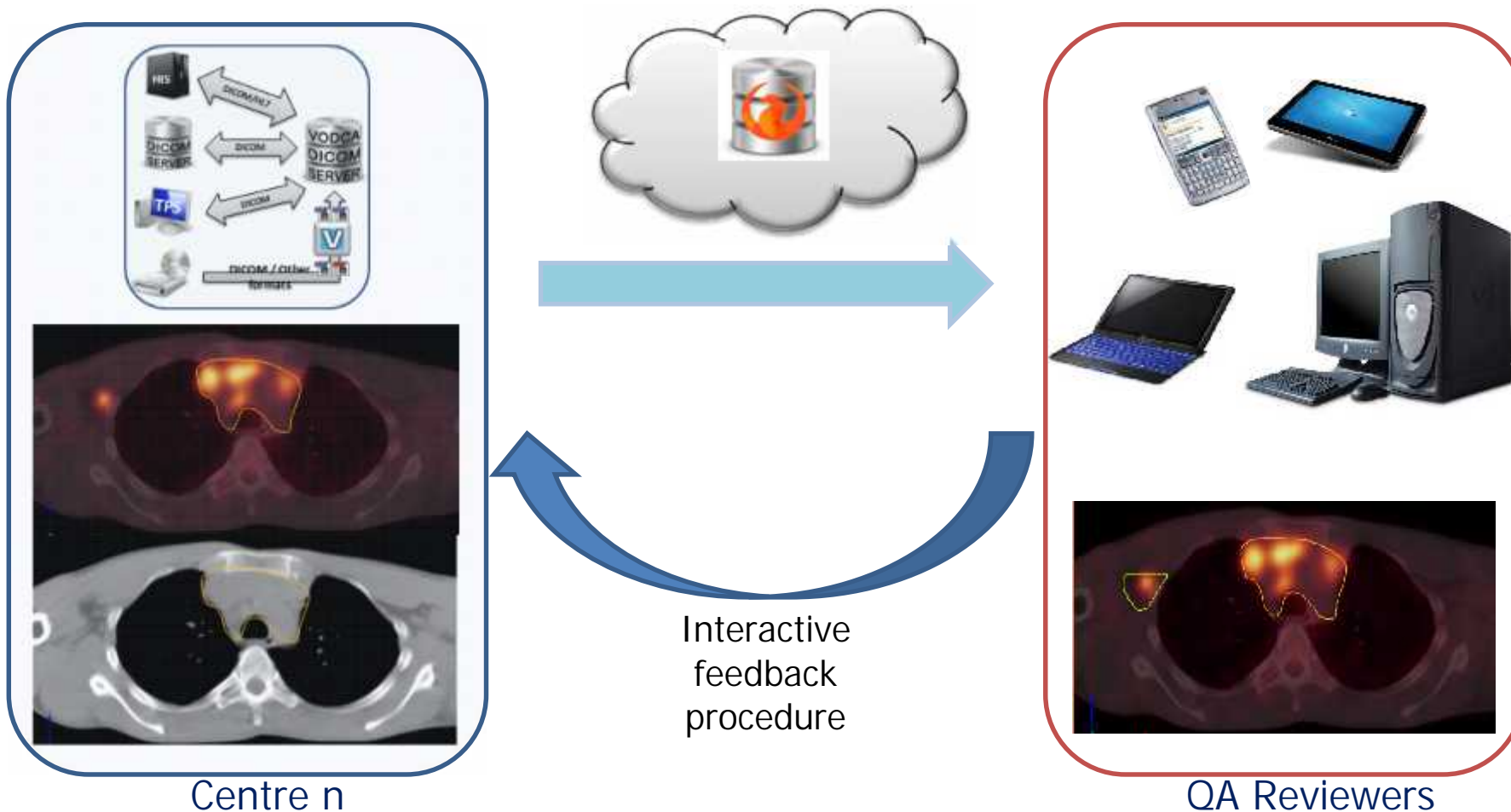
- Patient data,
- Treatment data, and
- Clinical data,

Data fields can be added or deleted at any time by the database administrator.

VODCA Network



“VODCA on the cloud”



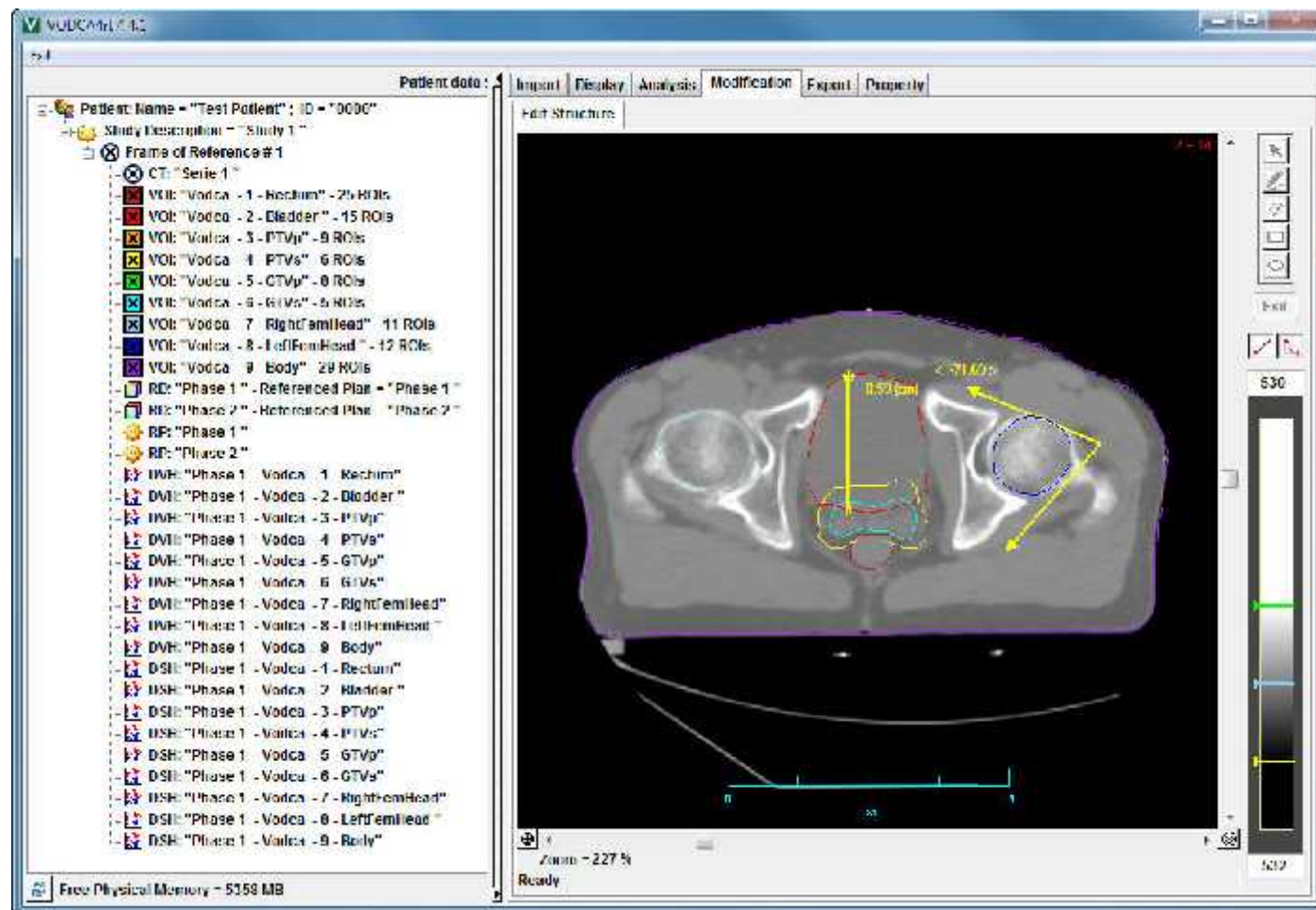
The “**VODCA Online Desktop**” is a powerful cloud-based Desktop with a customisable secure storage and it is accessible from anywhere, including tablets:



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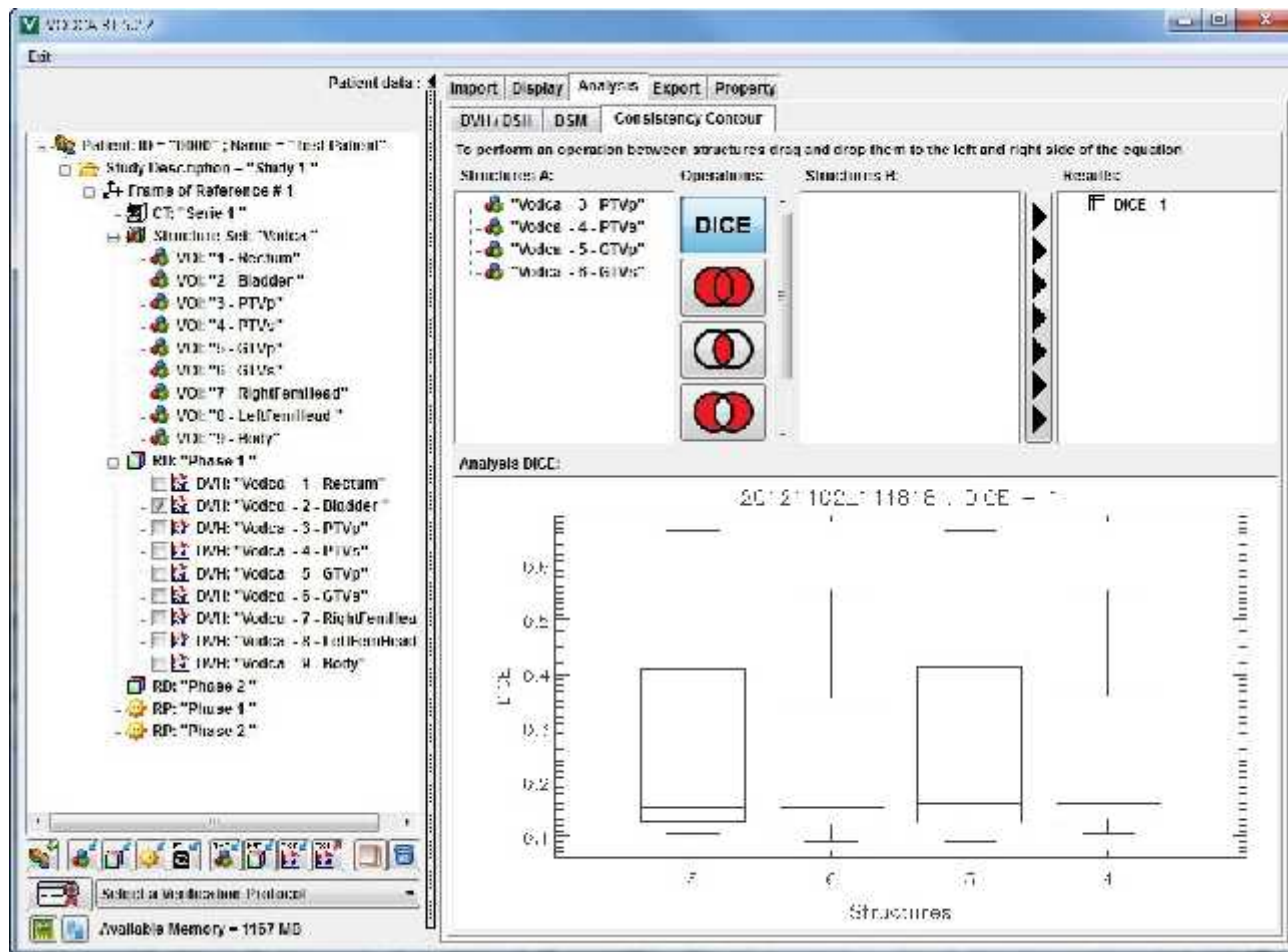
VODCA version 5

- Data Modification



VODCA version 5

- Module "Analysis" – Dummy-run



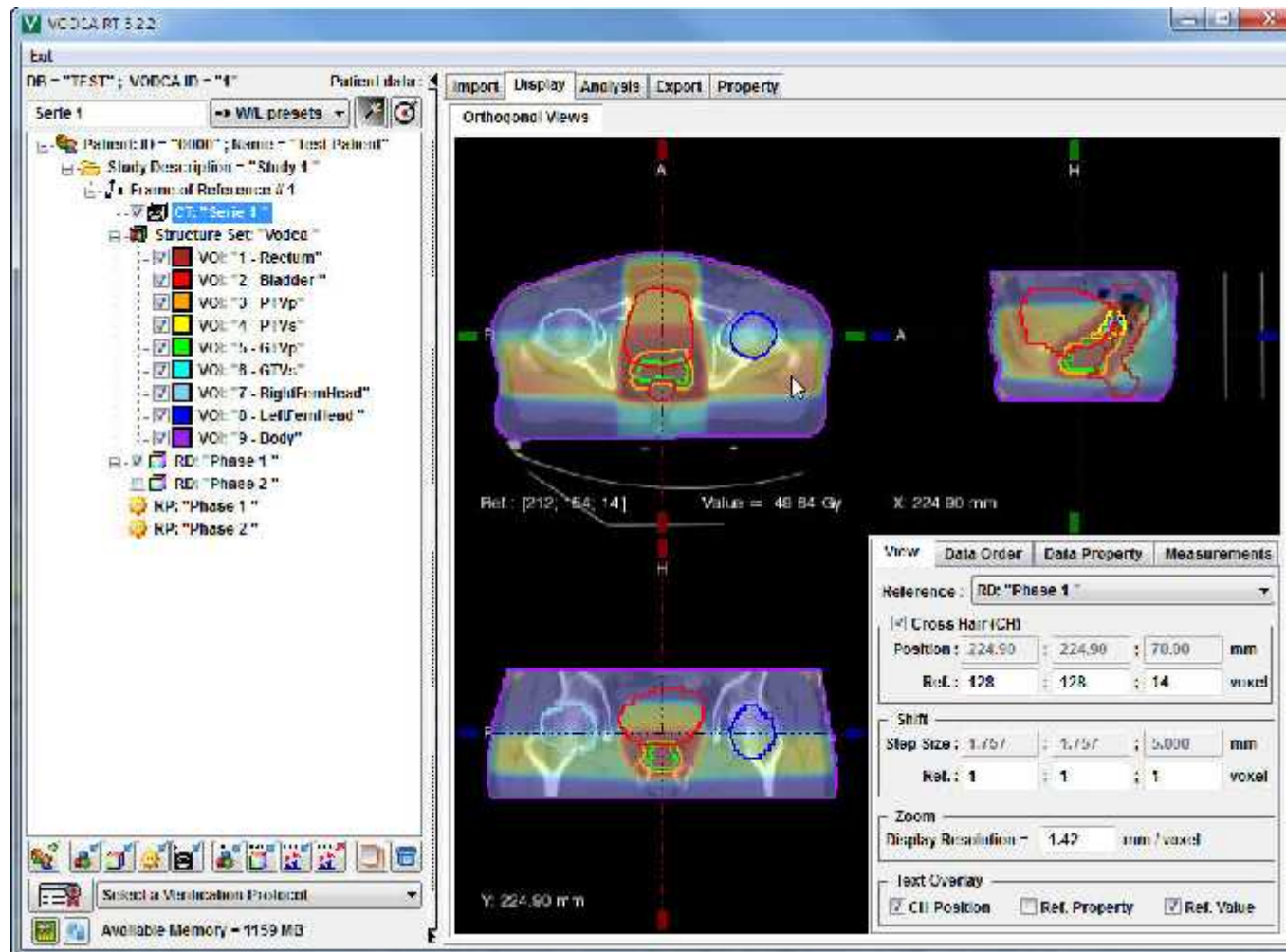
Consistency Contour

The following parameters are calculated :

- Sensibility
- Specificity
- Volume difference
- Isocentre difference

VODCA version 5

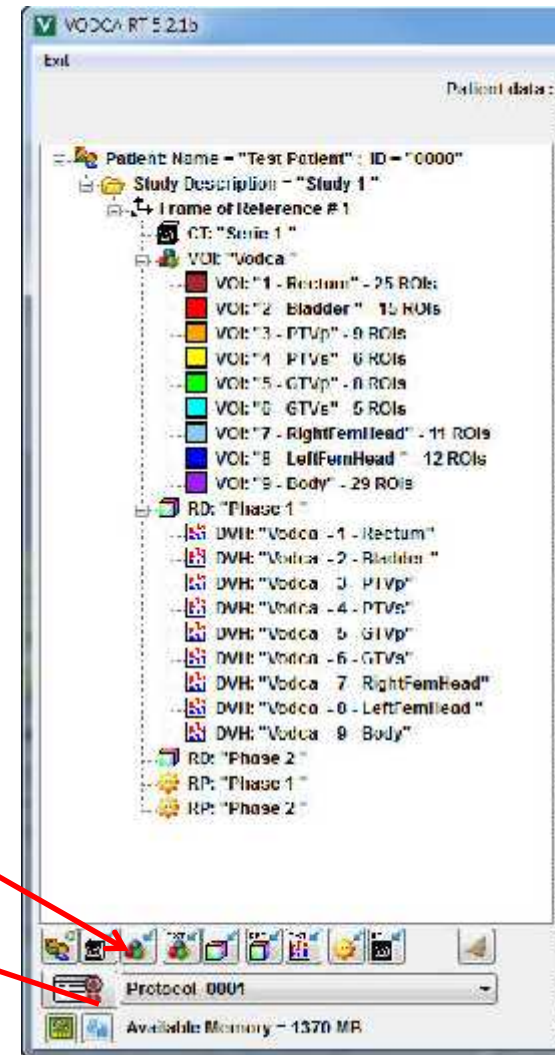
- VODCA RT : Module "Display"



VODCA version 5

- Data verification Protocol

```
File Edit Format View Help
Name - Protocol_0001
# -----
# @[Modality] [Module] [Tag] [Operator] [Value]
# -----
@[CT] [GeneralSeries] [0008,103C] [-] [Series 1]
@[VOI]-[StructureSet]-[3006,0020][3006,0026]-[-] [Rectum]
@[VOI]-[StructureSet]-[3006,0020][3006,0026]-[-] [Bladder]
@[VOI]-[StructureSet]-[3006,0020][3006,0026]-[-] [PTVp]
@[VOI]-[StructureSet]-[3006,0020][3006,0026]-[-] [PTVs]
@[VOI]-[StructureSet]-[3006,0020][3006,0026]-[-] [Rectum] AND
[VOI]-[StructureSet]-[3006,0020][3006,0026]-[>] [-100.0]
```



Available [Module] and [Tag] are listed in VODCA RT "Property"



Or in a format agreed with the EORTC HQ

Conclusions

QART

- Widen RT-DICOM IELSG37
- Prospective trials with VODCA?

Grazie

