

**Verslag van het college van geneesheren  
RADIOTHERAPIE-ONCOLOGIE  
contract 1 januari 2010 – 31 december 2010**

**Rapport du collège de médecins  
RADIOTHERAPIE- ONCOLOGIE  
contrat 1 januari 2010- 31 decembre 2010**

**Prof. Pierre Scalliet**  
Voorzitter-Président

**DEEL 2:**  
**RESULTATEN**

## **1. Werkgroep prostaat brachytherapie**

**Dr. P. Spaas**

**Belgian Working Group Prostate Brachytherapy**

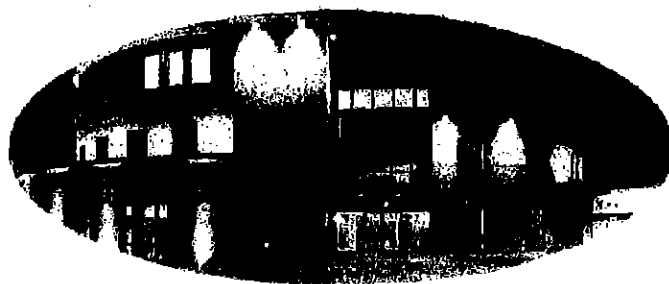
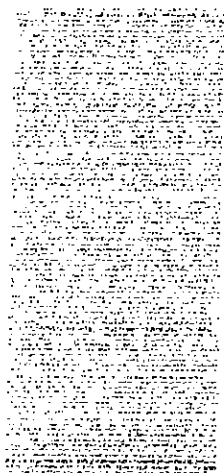
**Philippe Spaas moet verslag maken: opvragen**

### **PARTICIPATING CENTRES**

<b>AZ Sint-Maarten DUFFEL</b>
<b>Sint-Elisabethziekenhuis TURNHOUT</b>
<b>AZ Sint-Augustinus WILRIJK</b>
<b>AZ Middelheim ANTWERPEN</b>
<b>UZ LEUVEN</b>
<b>UCL St-Luc BRUXELLES</b>
<b>Europaziekenhuis BRUSSEL</b>
<b>CHIREC BRUXELLES</b>
<b>Clinique Générale St-Jean BRUXELLES</b>
<b>AZ Sint-Jan BRUGGE</b>
<b>AZ Groeninge KORTRIJK</b>
<b>Heilig Hartziekenhuis ROESELARE</b>
<b>AZ Sint-Lucas GENT</b>
<b>CHU CHARLEROI</b>
<b>Hôpital de Jolimont HAINE ST PAUL</b>
<b>Sart-Tilman LIEGE</b>
<b>Limburgs Oncologisch Centrum</b>
<b>Clinique St-Elisabeth NAMUR</b>

**2. On site visits: alanine dosimetry of the radiotherapy machines in Belgium**

**Ir. B. Schaecken - 12/10/2010**

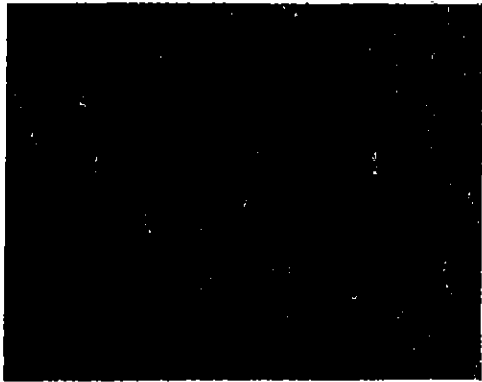


**E**

*Belgian Dosimetry Audits in Radiotherapy*

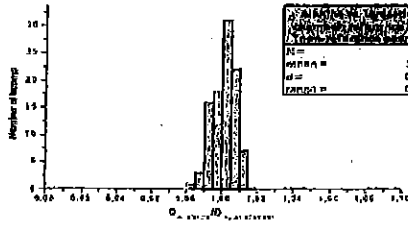
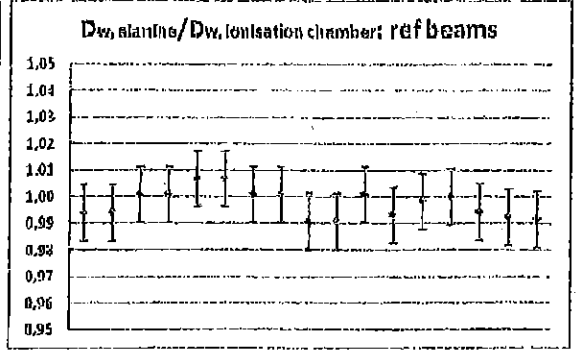
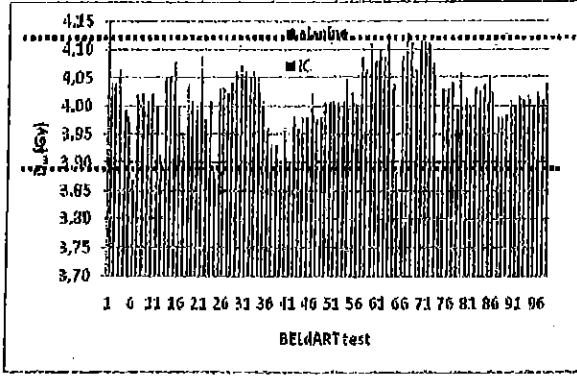
**1. Actual status:**

- **36 linacs:**    **Varian: 11;**  
                  **Siemens: 7;**  
                  **Elekta: 16;**  
                  **Novalis: 1;**  
                  **BrainLabAB/MHI "Vero": 1**
  
- **Dosimetry was checked in**
- **64 photon beams:**    **4x 4MV; 1x 5MV; 32x 6MV; 1x 10MV; 17x 15MV; 9x 18MV**
- **54 electron beams:**   **2x 4MeV; 1x 5MeV; 18x 6MeV; 1x 7MeV;**  
                              **3x 8MeV; 2x 9MeV; 3x 12MeV; 1x 14MeV; 9x 15MeV;**  
                              **12x 18MeV; 1x 20MeV; 1x 25MeV**
  
- **For 1<sup>st</sup> run measurements in photon beams:**
  - $D_{\text{mens}} / D_{\text{stated}} = 0.999, \sigma = 0.019$  (#778)
  - $D_{\text{aluthe}} / D_{\text{ionometry}} = 1.001, \sigma = 0.008$  (#98)



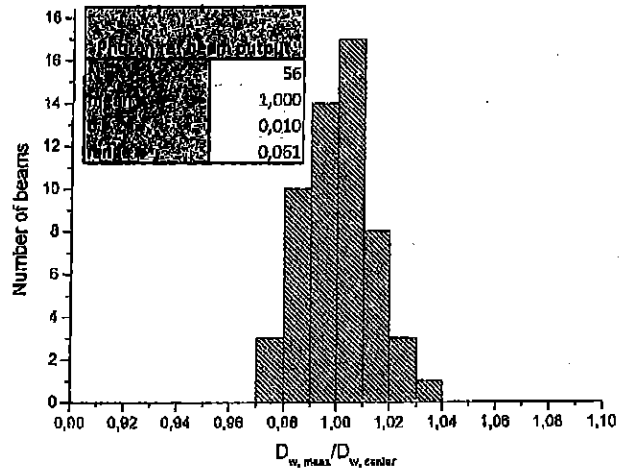
Copyright © 2008 by Elekta AB. All rights reserved.

**2. Traceability:**

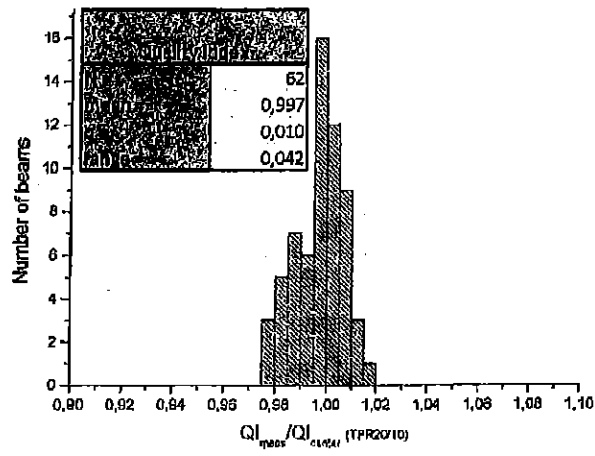


<b>Alanine/<math>D_w</math>, ionisation chamber: ref beams</b>	
N	= 17
mean	= 0,998
$\sigma$	= 0,006
range	= 0,016

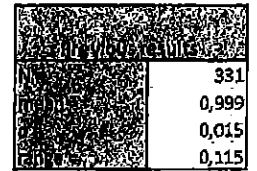
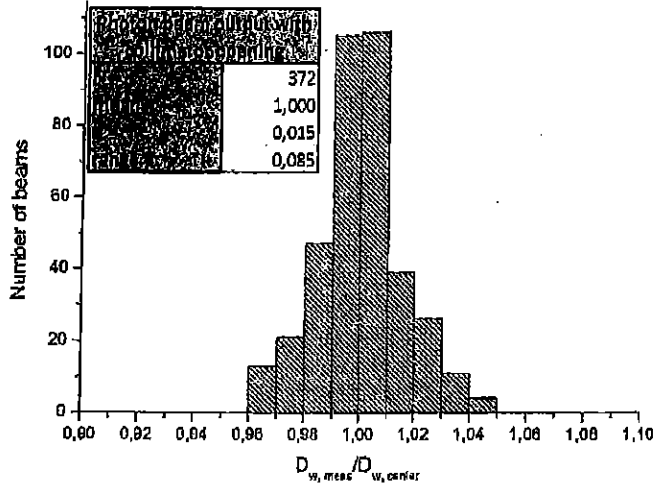
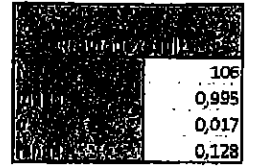
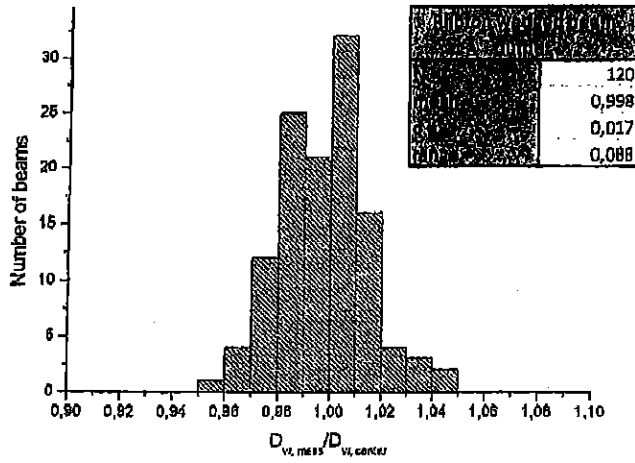
### 3. Results end septembre:



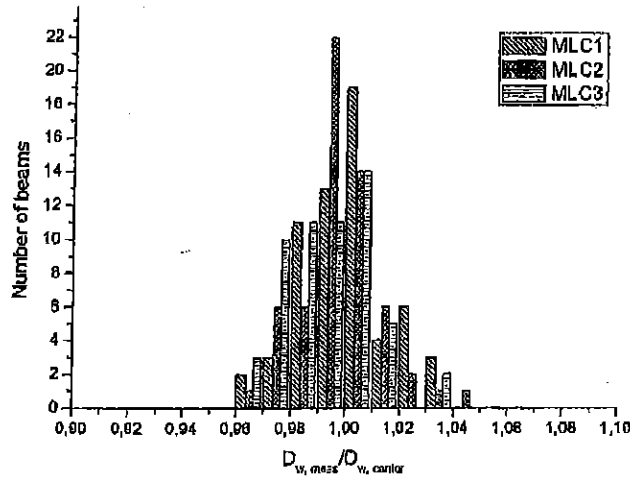
Previous results	
N	51
Mean	0,992
Std. Dev.	0,012
Range	0,056



Previous results	
N	55
Mean	0,997
Std. Dev.	0,009
Range	0,042



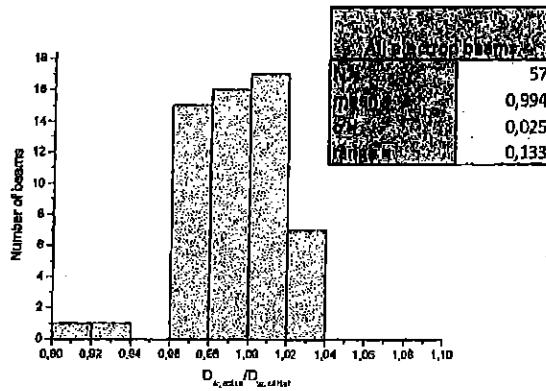




	61	59	56
	1,000	0,998	0,993
	0,016	0,015	0,017
	0,071	0,077	0,072

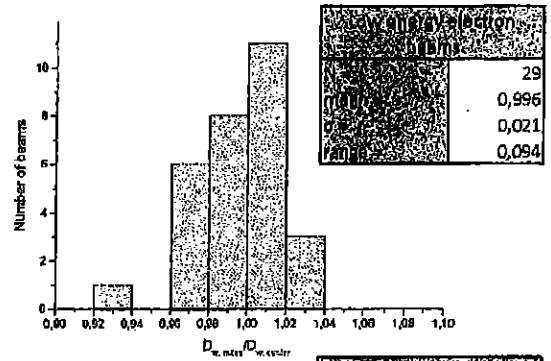
	51	51	49
	1,004	0,100	0,991
	0,014	0,013	0,014
	0,058	0,065	0,053

### 3. Results end septembre:

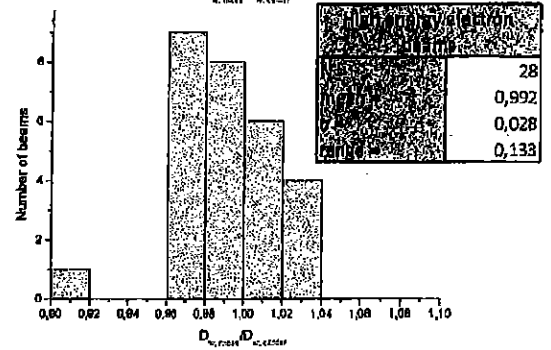


	57
	0,994
	0,025
	0,133

	48	24	24
	1,002	0,997	1,006
	0,024	0,022	0,026
	0,141	0,084	0,141



	29
	0,996
	0,021
	0,094



	28
	0,992
	0,028
	0,133

output measurements	$D_{meas}/D_{center}$	1s	R(min-max)	#
photon ref beam	1.000	0.010	0.061	56
QI (open beam)	0.997	0.010	0.042	62
wedged photon beam	0.998	0.017	0.088	120
regular field sizes	1.000	0.015	0.085	375
MTC1-3	1.000	0.016	0.071	61
	0.988	0.015	0.077	59
	0.999	0.017	0.072	56
electron beams	0.994	0.025	0.133	57

Results are incl. 2<sup>nd</sup>, 3<sup>th</sup> run measurements

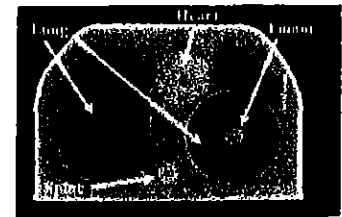
If deviations are observed, it's likely that they are systematic, even within optimal level...

Finding explanations for a deviation needs a detailed look-up...

Out of tolerance situations disappear in a 2<sup>nd</sup> run, although a clear explanation is difficult to find...

#### 4. Future: what did "the others"? (end-to-end tests for IMRT)

The RPC:



Design and Implementation of an antropomorphic QA phantom for IMRT for the radiation therapy oncology group  
Int J Radiat Oncol Biol Phys 63, 2005

Design, development and Implementation of the RPC's pelvis and thorax antropomorphic QA phantoms  
Med Phys 34, 2007

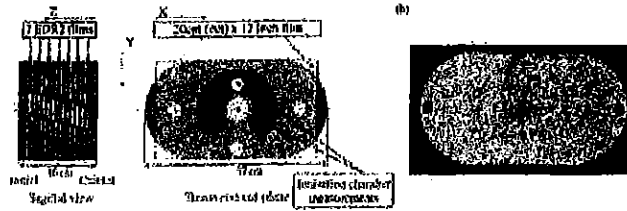
The Swiss:



FIG. 1. IMRT dosimetry phantom (RPC-Thorax)

The Swiss IMRT dosimetry intercomparison using a thorax phantom  
Med Phys 37, 4424-4431, 2010.

In the EU:



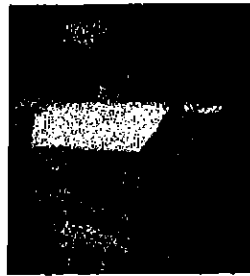
An Inter-centre QA network for IMRT verification: results of the ESTRO QUASIMODO project  
 Radiother Oncol 76, 2005

In the UK:



- 1- A dosimetric Intercomparison of kilovoltage X-rays, megavoltage photon and electrons in the Republic of Ireland  
 Radiother Oncol 48, 1998.
- 2- A versatile phantom for QA in the UK medical research Council RT01 trial in conformal therapy for prostate cancer  
 Radiother Oncol 80, 2006.
- 3- Dosimetry audit for a multi-center IMRT head and neck trial  
 Radiother Oncol, 36, 2009.

And far away...



Multicenter dosimetry study of mantle treatment in Australia and New Zealand  
 Radiother Oncol 40, 1996

## 5. Future:

### - Preservation of BELdART-expertise/ resources

- End project: feb 2012
- 1.8 FTE ( $\approx 84.000$  €)
- 207 beams within BELdART;  $\approx 247$  beams present + 6 Tomo
- Offering actual basic checks as "mailed audits"
- Offering beam output check for Tomotherapy



Static MSR field



rotational MSR field



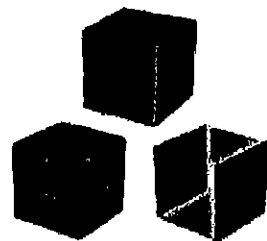
plan class MSR field



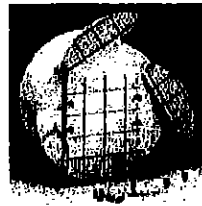
- Offering end-to-end test for IMRT: "plan class MS test"
  - head (stereotactic, IMRT brain,..)
  - thorax (lung...)
  - Pelvis ( prostate, gyneco, ..)
  - H & N: ?

### How we could proceed?

- complete the audit for the 40 remaining beams, as it is (visited audit)
- prepare for IMRT:
  - check 6 Tomo-machines (feasibility study now)
  - check Intra-cranial IMRT treatment
    - brain lesion IMRT
    - radiosurgery
    - dedicated, standardized phantom... ( $\approx 24.000$  €)
    - localization/ delineation becomes important!
    - benchmark with TLD (?)



Which phantom?



### 3. On site visits: Radiotherapie voor prostaatca

**Dr. Katia Vandeputte**

**Dr. Danielle Van den Weyngaert**

#### **Poster**

**A federal audit of the Belgian radiotherapy departments for prostate cancer radiotherapy treatment. Katia Vandeputte, Danielle Vandeweyngaert, Luc VanUytself, Pierre Scalliet, The Belgian Federal College of Radiotherapy**

*a Department of Radiation oncology, Cl. St. Elizabeth, Namur, Belgium, b Department of Radiotherapy UZA - ZNA, Antwerpen, Belgium, c Department of Radiation oncology Hellig Hart Ziekenhuis, Roeselare, Belgium, d, Department of Radiation oncology, University Hospital Saint Luc, Université Catholique de Louvain Brussels, Belgium*

**Purpose:** On behalf of the Belgian Federal College of Radiotherapy, an external audit of 375 prostate cancer patients (pts) files treated with external beam radiotherapy (EBRT) only or postoperatively was performed in all of the 25 Belgian radiotherapy centres.

**Methods:** Between May 2008 and October 2009 two experienced radiation oncologists from different centres site-visited all 25 departments. The verified items were: age of the patients; tumour staging (clinical and pathological); risk groups according to D'Amico; use of hormonal therapy (HT); dose-, volume prescription and quality control of the radiation treatment; type of surgery if performed; delay between surgery and start of EBRT postoperatively.

**Results:** 375 files were examined of which 236 (63 %) were treated with EBRT only and 139 (37%) received EBRT postoperatively. Mean age in EBRT only group was 72 yrs (range 49 -87) and 66 years (range 45-80) in the postoperative group. A pathological nodal staging was noted in 8.4 % of the EBRT only files by a lymphadenectomy pre-EBRT and in 45 % of the EBRT postoperative files.

Within the EBRT only group 11% were low risk patients, 30 % intermediate risk and 48 % high risk. The data of 11 % of the patients were insufficient to assess their risk. In the EBRT postoperative group, the preoperative risk assessment was low for 4 % , intermediate for 15%, high for 19% and 62 % was not assessable .

#### **EBRT only group**

In the postoperative EBRT group 33.8% of the pts received **adjuvant radiotherapy, (A-RT)** within 4 months after surgery with a mean PSA of 0.38 ng/ml (range 0.01 -4) at the start of radiotherapy. The A-RT started 15.8 weeks (range 3-54) after surgery. **Salvage EBRT (S-RT)** for rising PSA, was performed in 60.4 % of the pts with a mean PSA of 1.29 ng/ml (range 0.01 - 11,31) and the mean interval between surgery and start of EBRT was 170.2 weeks (range 12-800 ). **RT for clinical local recurrence** was performed in 5.8 %. Mean PSA in that group was 3.88 ng/ml (range 3.5 -12.50) and the mean interval between surgery and diagnosis of local recurrence and start of EBRT was 460.3 weeks (range 52-780).

In the postoperative EBRT group the **dose prescription** was respectively 65.8 Gy (range 60 -73.8 ) for A-RT group, 67.9 Gy (range 60 -74.4 ) for S-RT group and 69.5 Gy (range 64 -74 ) for the clinical local recurrence group.

#### **EBRT postoperative group:**

In the EBRT only group, no significant difference in prescribed total **dose to the prostate** was seen between the different risk groups. The average prescribed dose to the prostate was 72.5Gy. However, important fluctuations between minimum and maximum prescribed dose was noted, from 54Gy ( aT4, palliative RT) to 83.6 Gy. The variability in dose prescription is much larger for the **dose to the seminal vesicles** which varies from 53 Gy to 60.12 Gy. The minimum and maximum prescribed dose varies from 45 Gy to 83.6 Gy.

The indication of **lymph node irradiation** varies between the different centers and was performed in 17 of the 25 centers. In the EBRT only group, a total of 157 pts (42 %) received **hormonotherapy** concurrently with the radiation treatment: 6/26 (23 %) of low risk pts, 35/70 (50 %) of intermediate risk pts, 107/113 (95%) of high risk pts and 9/27 (33%) of pts with undeterminable risk.

Dose prescription prostate

Dose prescription seminal vesicles

**Conclusion:** There was a high degree of conformity in most of the Belgian radiotherapy centers with the minimal requirements for documentation of radiotherapy prescription and administration. For the exclusive radiotherapy indications, variations in dose prescription are especially seen for seminal vesicles and pelvic lymph nodes. There is a clear trend for concomitant hormonal treatment for more aggressive tumors.

Postoperative radiotherapy is very well established and is commonly started as soon as PSA is rising.

A multidisciplinary approach is essential to keep clinical habits adapted to the current medical standards

**Barcelona ESTRO 2010**

**72.08 GY**

**73.64 GY**

**72.43 GY**

**72.54 GY**

**Dose prescription lymph nodes**

**Hormone prescription****53.59 Gy****60.12Gy****56.44Gy****54.43Gy****Dose prescription prostate****Dose prescription seminal vesicles****4%****16%****22%****89%****RT Dose****PSA atstartof RT****Delay to startRT****60.4%****33.8 %****5.8 %****Postop.RT indication****11%****30%****48%****11%****23%****50%****95%****33%****15 weeks****170 weeks****460 weeks****0.38ng/ml****1.29ng/ml****3.88ng/ml**



**4. Procare**

**Prof. Dr. P. Scalliet**

6-9-2011

**Improving care of rectal cancer in Belgium by standardizing CTV delineation**

**The PROCARE RT project**

Eszter Hortobagyi  
Prof. Karln Haustermans, Prof. Pierre Scalliet

**Introduction**

- Current status
- Review procedure
- Analysis of results
- Next steps

- Current status
- Review procedure
- Analysis of results
- Next steps

**Brief history**

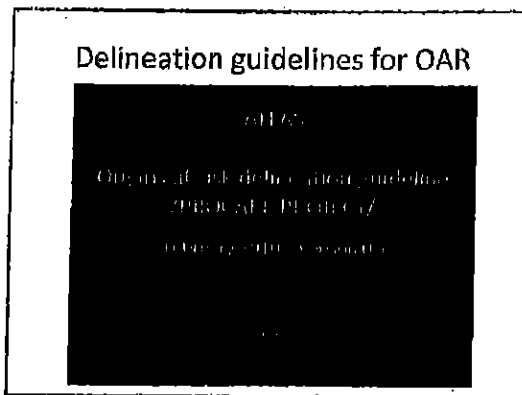
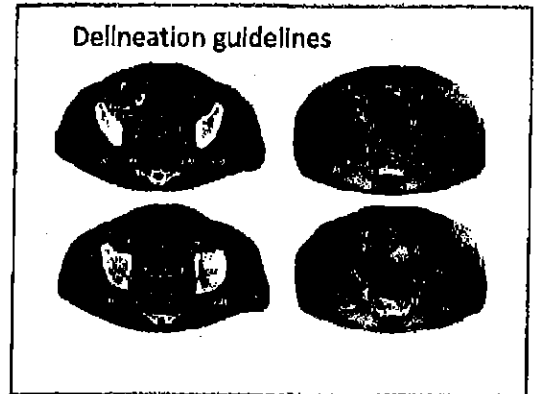
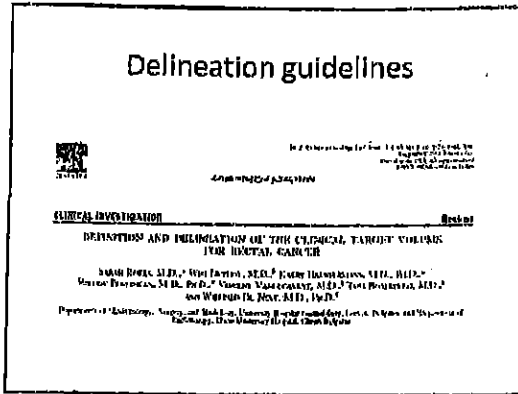
- 2009 Nov – first Aquilab Installation
- 2010 March – start of the review with 3 centers
- 2010 April – launch of the official test /4 centers/
- 2010 May – full operation between 10 centers
- 2011 March – 18 centers participating

**Clinical guidance**

- 2010 March – /On the previous College meeting/ a CD distributed
  - Procure guidelines
  - A CTV delineation atlas
  - The ESTRO teaching course presentation
  - An OAR delineation atlas
  - The manuscript on CTV delineation

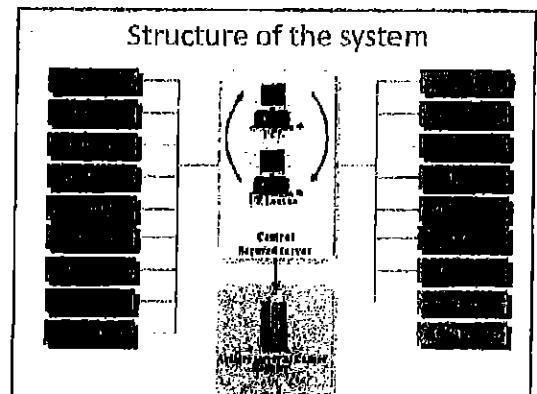
**Clinical guidance**

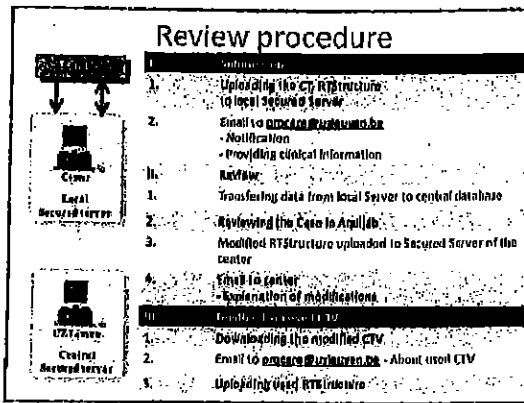
- Guidelines for CTV delineation peer reviewed and published
  - A common solution to all
- Guidelines for OAR reviewed by abdominal radiologist (F. Claus)
- Eszter Hortobagyi trained by UZL and half time appointed to Procure project



- Current situation
- 21 centers agreed to participate in the QA Procure network with Aquilab as platform
  - 20 centers have their license installed
  - 18 centers have been connected to the network /submitted at least one case/

- Current status
- Review procedure
- Analysis of results
- Next steps





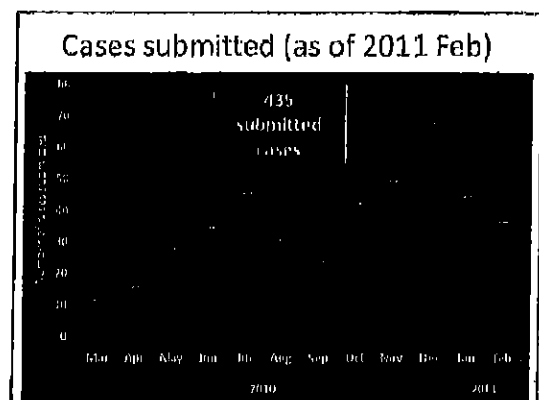
- ### Required Information
- Name of the sender hospital
  - Identification of the patient
  - National registration number -/INSZ-NISS/
  - TNM Staging
  - Localization of the tumor
  - Name of the hospital where the surgery or chemotherapy is planned
  - Any further comment

- ### Agreement
- Contours are reviewed within 24 hours
  - If uncertain: supervision by Professor Scalliet and/or Professor Haustermans
  - Modified CTV structures are sent back as "CTV-mod"
  - It is not mandatory to implement the modifications!
  - Please send back "CTV-used"

- ### Agreement
- Delineation of OAR is not required but highly recommended
  - UZ Leuven is checked by UCL and vice versa
  - The final database will be archived at the Cancer Registry using national registration number-NISZ/INSS

### Cases submitted (as of 2011 Feb)

	2010												2011		
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
Center 1															
Center 2															
Center 3															
Center 4	2	1	2	4	1	3	3	2	4	7	5	4			
Center 5					1	0	0	2	5	0	0				
Center 6			1	1	1	1	1	1	1	2	4	5	1		
Center 7															
Center 8				1	3	0	1	0	1	1	0	0			
Center 9					1	0	0	0	0	0	0	0			
Center 10							2	2	1	1	2	0			
Center 11															
Center 12	3	2	6	5	3	2	2	3	2	3	2	0			
Center 13	5	10	6	6	14	11	5	0	0	12	6	4			
Center 14									1	1	2	3	3		
Center 15		2	1	0	1	1	2	3	3	4	3	0			
Center 16			2	4	5	1	1	0	2	5	1	1			
Center 17				3	0	3	2	5	8	7	4	2			
Center 18							2	5	1	1	3	4			

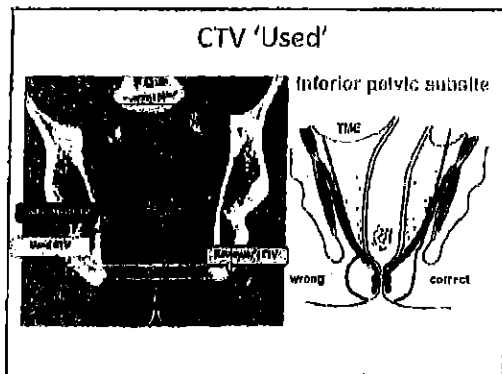
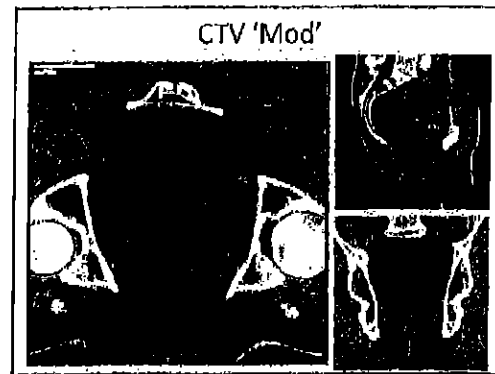
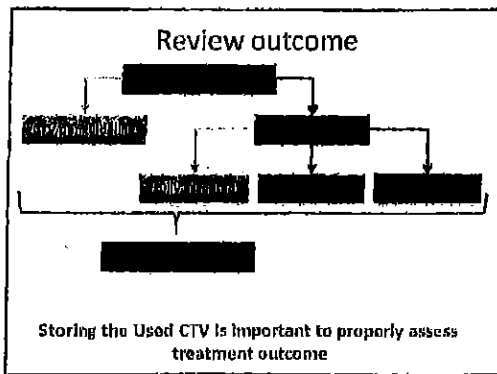


### Localization (as of 2011 Feb)

Third	Nr. of cases	% of cases
<b>Low</b>	<b>202</b>	<b>46.4%</b>
Low-Med	20	4.6%
<b>Med</b>	<b>123</b>	<b>28.3%</b>
Med-High	19	4.4%
<b>High</b>	<b>62</b>	<b>14.3%</b>
Not provided	9	2.1%
<b>Total</b>	<b>435</b>	

### Modifications (as of 2011 Feb)

Center	Cases at treated	no. of modified	% modified
Center 1	20	20	100.0%
Center 2	28	26	92.9%
Center 3	1	1	100.0%
Center 4	35	29	84.3%
Center 5	0	0	100.0%
Center 6	21	19	90.5%
Center 7	8	8	100.0%
Center 8	18	18	100.0%
Center 9	2	2	100.0%
Center 10	12	11	91.7%
Center 11	7	8	114.3%
Center 12	37	32	86.5%
Center 13	24	17	70.8%
Center 14	11	13	118.2%
Center 15	21	23	110.0%
Center 16	10	10	100.0%
Center 17	10	10	100.0%
Center 18	21	15	71.4%
<b>Total</b>	<b>435</b>	<b>396</b>	<b>90.8%</b>



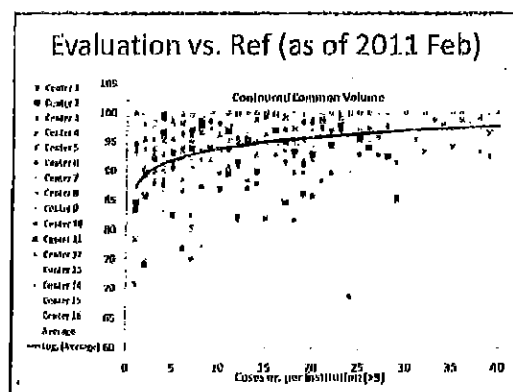
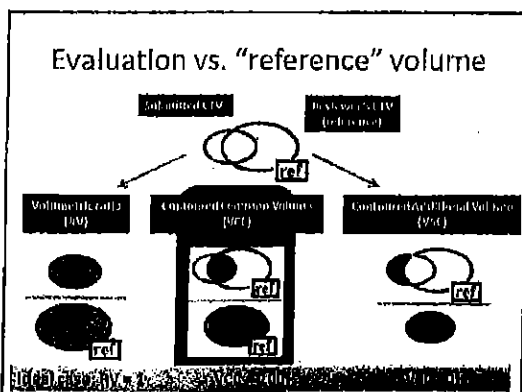
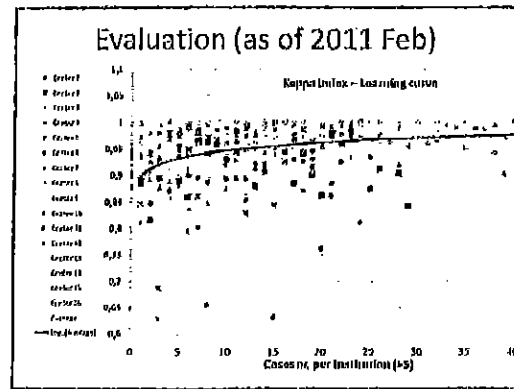
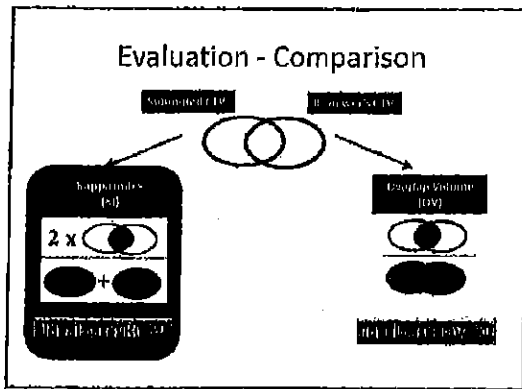
### Review outcome (as of 2011 Feb)

Center	Medicinal	Only corrected	Partly medicinal	Unchanged	Unacceptable
Center 1	25	21	2	0	0
Center 2	24	26	0	0	0
Center 3	1	0	0	1	0
Center 4	25	29	0	0	0
Center 5	0	1	3	4	0
Center 6	12	10	9	0	0
Center 7	8	7	1	0	0
Center 8	18	0	0	0	18
Center 9	9	2	0	0	1
Center 10	11	0	0	3	0
Center 11	9	2	1	1	0
Center 12	32	33	1	6	0
Center 13	17	12	0	8	0
Center 14	15	13	1	1	0
Center 15	22	14	0	8	0
Center 16	25	10	0	6	0
Center 17	10	11	0	12	1
Center 18	17	17	0	5	1
<b>Total (26)</b>		<b>20.6%</b>	<b>5.9%</b>	<b>16.7%</b>	<b>6.9%</b>

**OARs (as of 2011 Feb)**

<b>All cases</b>	<b>435</b>	
<b>OAR present</b>		
<b>Femoral heads</b>	<b>356</b>	<b>81.8%</b>
<b>Bladder</b>	<b>407</b>	<b>93.6%</b>
<b>Small bowel</b>	<b>305</b>	<b>70.1%</b>

- Control status
- Review procedure
- Analysis of results
- Next steps



- Current status
- Review procedure
- Analysis of results
- Next steps

**Procare – Radiotherapy Submission Form  
Version 1.0 - 2011 March**

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**Instructions**

1. Please read the form, with the guidelines on (radio)therapy, and return it to the secretariat.
2. There are two parts to the form: the first part is for the general information and the second part is for the radiotherapy details.
3. The form is to be filled in by the radiotherapy department.
4. The form is to be filled in by the radiotherapy department.
5. The form is to be filled in by the radiotherapy department.
6. The form is to be filled in by the radiotherapy department.

**Any further information**

Please contact the secretariat for any further information.

The PROCARE website is at:

- PROCARE on the web**
- <http://www.registreduncancer.be/>
  - PROCARE
    - Latest news

**5. Incident report systems**

**Prof. Dr. P. Scalliet**  
**Prof. Dr. C. WELTENS**

**ADHECO**

An incident management system used for incident registration and benchmarking is proposed by Adheco (<http://www.adheco.be/>). The proposed system is the PRISMA RT system. In this system both the analysis and classification of the incidents are performed by trained personnel of the department itself, but benchmarking with other departments (national, international) is also possible.



## Quality management systems (QMS)

### C. WELTENS

The implementation of a Quality Management System in the Belgian Radiotherapy departments is coordinated by the College. This project consists of 3 sub-projects:

1. Installation of an INCIDENT REPORT SYSTEM
2. Participation to external dosimetry audits (see chapter about Beldart)
3. Participation to on site audits (organized by the college, starts in 2011)

The installation of Quality management systems is funded by the "Nationaal Kanker Plan/Plan National Cancer". This plan includes the progressive installation of a QMS in all radiotherapy departments (5 departments start each year). The QMS consists of the installation of an incident reporting system and the participation to external dosimetry audits. Furthermore on site audits are planned.

**In 2010 the College focused on the preparation of the Implementation of the Incident Report System.**

Following steps were prepared in 2010:

1. Configuration Hosting environment
2. Installation Benchmark environment
3. Installation Basic Environment (Proof of concept)
4. Installation 25 environments (13 Dutch, 12 French)
5. Communication towards all members to officially announce the project
6. At the same time invite all members to join network
7. Invite members to participate in POC
8. Communicate further timelines:
  - o Start POC
  - o Evaluation & validation POC
  - o Start national Network
9. Start PR activities towards media

#### Planning for 2011:

1. Information to all radiotherapy departments about installation of PRISMA RT
2. Installation of the system in the 5 first departments: ZNA, Sint Augustinus, UZLeuven, Bordet en Roeselare
3. Education of the quality coordinators

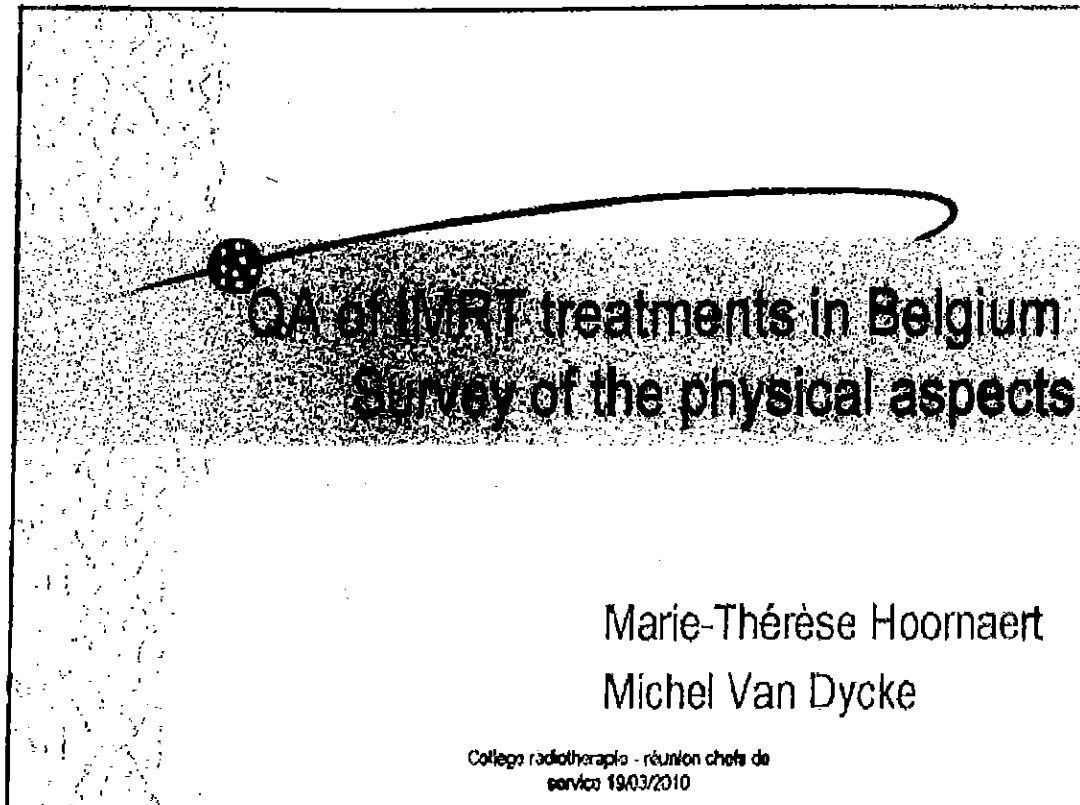
#### Planning for 2012

1. Installation of the system in the 5 departments: CHU André Vésale, Saint Luc, CHIREC, Baudour, RUG
2. Organisation of a national and international benchmark

**6. IMRT**

**M. Van Dijcke**

**MT. Hoornaert**



## Introduction

- ✦ Purpose : overview of the situation in Belgium regarding QA programs for the physics part of IMRT
  
- ✦ Diffusion : Website BHPA to the members

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## Introduction

- ✦ Questionnaire divided in three parts :
  - General information
  - Specific IMRT QC on treatment machines
  - Patient related QA

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## Preliminary results

- ✚ Answers : 15 / 25 centres
  - 14 doing IMRT
  - 1 not
- ✚ Incomplete questionnaires
- ✚ 1 centre, 2 questionnaires

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## General information from 14 centres

Type	Modality	First treatment	% IMRT	localisation
StepShoot: 7	7 Varian 1 Novalis	1 in 1995 Others: 2001 to 2009	2 = 63% • > 50% : 2 • (20-50)% : 1 • (10-20%) : 4 • < 10% : 5 • no answer : 3	Prostate, HN, Brain, Breast (?) Gyn .....
Dynamic : 8	4 Elekta 2 Siemens			
Rapid Arc : 2	3 Tomo			
Tomo : 3				

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## Patient related QA

### ✦ Before start of treatment :

- individual field fluence
  - $\sigma^{\circ}$
  - treatment gantry angle
- global dose distribution

### ✦ During treatment

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## IMRT treatment machines

Specific tests performed	Type	Performed by	Periodicity	Time spent
12 yes 2 no 1 ?	Machine + type IMRT dependant: Ex DMLC : Garden fence Sweeping gap	Physicist	D,W,M,	11 answers : 10 min -- 3h (mean 47 min) Equipment dependant

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### Patient related QA before treatment

Performing	Each patient	Time spent	MU check	Who
14 yes 1 ?	12/14 (85.7%)	15 min (1) Up to 4h Mean 92 min	7 (50%)	Physicist 100% (1 +other)

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### Patient related QA before treatment

Individual fields	Detectors	Analysis	Acceptation criteria	Protocoles
12 yes 2 no 1 ?	Films : 3 2D array: 11 IC : 6 (some) EPID : 7	$\gamma$ 3mm, 3% : 11	95% pts $\gamma < 1$ : 8 Missing answers	ESTRO draft : 3

### Patient related QA before treatment

Global	Detectors	Analysis	Acceptation criteria	Each patient
12 yes 2 no 1 ?	Films : 6 2D array: 4 IC : 7 (some)	$\gamma$ 3mm,3% Dose : 3-5%	90-95% pts $\gamma < 1$ Missing answers	9 yes 3 no 1 ?

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### Patient related QA during treatment

- ✶ Performed by 4 centres only
  - In vivo : TLD, transit dosimetry, diode
  - Other methodology :
    - analysis of delivered fluence
    - Measured sinograms from CT det

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**Q** **total related QA**  
**MU**

**Q** total MU for 2 Gy :

- ont répondu : prostate 11  
                          head and neck 8
- prostate : min 300 (mean linac 432)  
                          max 1050 (mean linac 734)
- Head Neck : min 390 (mean linac 673)  
                          max 1500 (mean linac 1200)
- Difference tomo/SMLC/DMLC

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## Conclusions

### ✧ Preliminary results :

- missing answers from centres performing IMRT
- one answer/centre → one answer/machine
- incomplete answers : acceptation criteria
- difficult analysis :
  - small numbers
  - different configuration
- Complementary informations to be asked to some participants

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## Conclusions

### ✧ Comparison with other studies:

- IAEA
- Dutch (In Holland IMRT school)
- .....