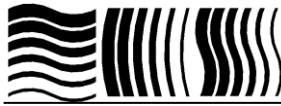


## ANNUAL REPORT 2012

### Objective

The Nederlandse Commissie voor Stralingsdosimetrie (NCS, Netherlands Commission on Radiation Dosimetry) was established on the 3<sup>rd</sup> of September 1982 with the main objective of promoting the appropriate use of radiation dosimetry, both for radiation research and for practical applications. The NCS is chaired by a board of scientists, installed in consultation with the supporting societies:

- Nederlandse Vereniging voor Radiotherapie en Oncologie (NVRO, Dutch Society for Radiotherapy and Oncology);
- Nederlandse Vereniging voor Nucleaire Geneeskunde (NVNG, Dutch Society for Nuclear Medicine);
- Nederlandse Vereniging voor Klinische Fysica (NVKF, Dutch Society for Medical Physics)
- Nederlandse Vereniging voor Radiobiologie (NVRB, Dutch Radiobiological Society);
- Nederlandse Vereniging voor Stralingshygiëne (NVS, Society for Radiological Protection of the Netherlands);
- Nederlandse Vereniging Medische Beeldvorming en Radiotherapie (NVMBR, Dutch Society for Medical Imaging and Radiotherapy);
- Nederlandse Vereniging voor Radiologie (NVvR, Radiological Society of the Netherlands);
- Société Belge des Physiciens des Hôpitaux/Belgische Vereniging voor Ziekenhuisfysici (SBPH/BVZF, Belgian Hospital Physicists Association);
- Nederlandse Vereniging van Klinisch Fysisch Medewerkers (NVKFM, Dutch society of Medical Physics Engineers)



To pursue its aims, the NCS has the following tasks:

- Participation in dosimetry standardization and promotion of dosimetry inter-comparisons;
- Drafting of dosimetry protocols;
- Collection and evaluation of physical data related to radiation dosimetry;
- Maintain or establish links with national and international organizations concerned with ionizing radiation;
- Promulgate information on new developments in the field of radiation dosimetry.

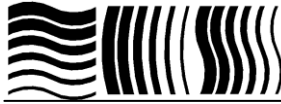
Websites:

<http://www.stralingsdosimetrie.be>,

<http://www.radiationdosimetry.eu>,

<http://www.stralingsdosimetrie.nl>,

<http://www.radiationdosimetry.org>



## **Board**

On December 31, 2012 the members of the board of the NCS were:

Dr. J.B. van de Kamer	chairman	(NVRO)
T.W.M. Grimbergen	vice chairman	(NVS)
Dr. J.A. de Pooter	secretary	(VSL)
Dr. A. Van Der Plaetsen		(SBPH/BVZF)
J.M.J. Hermans	treasurer	(NVKFM)
Prof. Dr. A.A. Lammertsma		(NVNG)
Dr. P. Sminia / Dr. K. Franken		(NVRB)
Dr. A. Spilt		(NVvR)
Dr. Ir. F.W. Wittkämper		(NVKF)
D. Zweers		(NVMBR)

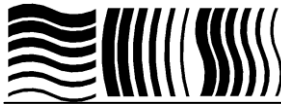
The board of the NCS met four times in 2012, i.e., on 26 January, 12 April, 30 August, and 13 December.

The main subjects raised at the board meetings were:

- Monitoring the progress of activities by the subcommittees and the platform;
- Initiate the publication of NCS-reports;
- Development of new activities.
- Organization of the 6<sup>th</sup> NCS lustrum symposium

D.Zweers has decided to end his membership of the NCS board by 31<sup>st</sup> of December 2012. Dirk has been a member of the NCS board for more than 17 years. Among other, he contributed to the organization of several NCS lustrum symposia. The board wants to thank him for his valuable contribution and commitment in these years. The representation of the NVMBR will be filled in by M. Zeeman from the 1<sup>st</sup> January 2013.

In 2012 the NCS has celebrated its 30<sup>th</sup> anniversary with the organization of the 6<sup>th</sup> lustrum symposium. This symposium with the title "Radiation dosimetry: balance between safety and cure" was organized on October 5<sup>th</sup> in Leiden.



## Subcommittees

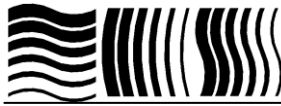
### 1. *Subcommittee on Quality Control of Stereotactic Radiotherapy: Recommendations on dosimetry procedures and Quality Control*

A rapidly growing number of radiotherapy centers in the Netherlands and Belgium are being equipped for stereotactic radiotherapy, i.e. stereotactic surgery (SRS) and stereotactic radiotherapy (SRT). In radiotherapy centers the development is focused on imaged guided “frameless” high-dose high precision techniques with standard and dedicated linear accelerators, e.g. Novalis and Cyberknife. “Frameless” here means “without an invasive or relocatable localizer and treatment frame fixed on the skull of the patient with the aim to fix the patient on the treatment couch”. On the other hand, in a free-market concept in health care non-image guided stereotactic treatment with a GammaKnife might become popular for non-radiotherapy enters due to its apparent simplicity relative to linac-based stereotactic treatment.

In stereotactic treatments very high fraction doses are delivered, while a high accuracy in (re)positioning of the tumor with respect to the isocenter is required. Irrespective of the devices used. Therefore, stereotactic treatments require higher accuracy levels in equipment and processes compared to standard radiotherapy treatments. This necessitates more attention to the quality assurance of both treatment devices and treatment process than for other complex treatments. Experiences from well-established stereotactic treatment centers learn that the introduction and maintenance of stereotactic radiotherapy in the clinic means the acceptance, commissioning and QA of a stereotactic treatment system as an entity, both in devices and in process. So, on one side this includes the acceptance, commissioning and QA of the hardware (e.g. linac, mMLC, cone, frames, couch), and software (TPS), as well as the imaging-system and systems for detection and (re)position tumor at isocentre. On the other side, QA of the treatment process itself is important but often overlooked: manpower trained at expert-level is required, working as a team and embedded in a well-structured organization.

The goal of the subcommittee is to compose a report that provides recommendations for Belgian and Dutch medical physicists on dosimetry procedures and quality assurance for add-on stereotactic equipment, dedicated fully integrated systems and the treatment process. The subcommittee “Quality Control of stereotactic radiotherapy” was started in January 2006. In 2012 the subcommittee had 2 meetings alternately held in Belgium and the Netherlands and 2 phone call meetings. In 2012 the final structure of the report was setup and filled-in. Due to this structure, the concept- title is changed a little: *Quality Assurance in Process management & Treatment technique: “Intracranial Stereotactic Treatment”*. It is the expectation that the report will be finished in 2013

In 2008 a prototype phantom is designed and constructed for end to end tests based on EBT gafchromic film dosimetry in the hospitals of the members of the subcommittee. The purpose of this prototype was to show the feasibility of such a phantom for the various SRS/SRT treatment techniques. Due to instabilities in dosimetrical accuracy of gafchromic film, nowadays still present, and time available in daily routine, it was not possible to start yet with the end to end tests. Due to involvement in other activities, Dirk Verellen is not able to participate actively in the sub-committee. He will remain available for consultation. His active role will be fulfilled by Thierry Gevaerts.



Members of this NCS subcommittee:

Stan Heukelom (Vrije Universiteit Medisch Centrum, Amsterdam, chairman)  
Hans Marijnissen (Erasmus MC, Rotterdam),  
An Nulens (UZ Gasthuisberg, Leuven)  
Geert Pittomvils (UZ, Gent)  
Esther Raaijmakers (Dr. B. Verbeeten Institute, Tilburg)  
Dirk Verellen (UZ, Brussels)  
Thierry Gevaerts (UZ, Brussels)  
Sandra Vieira (Vrije Universiteit Medisch Centrum, Amsterdam, secretary),  
Nienke Holtzer ((Vrije Universiteit Medisch Centrum, Amsterdam)  
Joep Hermans (Maastrou, Maastricht, representative from the NCS-board).

## 2. *Subcommittee on Dosimetry Audits*

The goal of the subcommittee is to design and administer an audit on absolute dosimetry in radiotherapy institutes in the Netherlands and Belgium. The audit is based on the new NCS dosimetry protocol (NCS 18). In first instance, this audit will be limited to high-energy photon beams. In the future the subcommittee expects to include high-energy electron beams.

The subcommittee has worked in 2012 on reporting the audit.

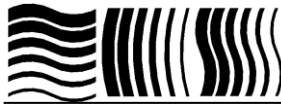
The focus of the subcommittee in 2013 is finalizing the report of the audit. Furthermore, a start will be made with designing the next audit including electrons.

Members of this NCS subcommittee:

Thijs Perik (NKI, Amsterdam, chairman)  
Jonathan Martens (Maastrou, Maastricht, treasurer)  
Marian Dwarswaard (MCA, Alkmaar, secretary)  
Erik Loeff (Erasmus MC, Rotterdam)  
Ester Peeters-Cleven (MST, Enschede)  
Sander v/h Schip (CZE, Eindhoven)  
Joep Hermans (Maastrou, Maastricht)  
Nicolette Planteydt (ZRTI, Vlissingen)  
Tony Aalbers (Utrecht, advisor)  
Leon de Prez (VSL, Delft)  
Frits Wittkamper (NKI, Amsterdam, advisor)  
Francois Sergent (CHU, Charleroi)  
Karen Feyen (AZ St. Maarten, Duffel)

## 3. *Subcommittee on Guidelines for Quality Assurance of Helical Tomotherapy*

Helical Tomotherapy is a modality for radiation therapy treatment with integrated systems for treatment planning, imaging, image registration and dose delivery. It has several differences compared to conventional linear accelerators, which imply that general Quality Assurance guidelines are not always applicable or sufficient. For example, current dosimetric protocols, based on the absorbed dose (NCS 18, AAPM TG-51), require calibration measurements under reference conditions. These reference conditions can not be met. New methodologies are proposed in literature and are currently under discussion. Other specific QA issues concern the acceptance testing and commissioning of the complex integrated systems, verification of dose planning and delivery, mechanical QA and patient safety. The goal of this report is to provide



guidelines for QA and dosimetric calibration of the Helical Tomotherapy system.

Originally, the mandate of the subcommittee was to develop not only a guideline for Tomotherapy but also for Cyberknife. Due to the withdrawal of one of the experienced Cyberknife users the board of the NCS decided to change the mandate to Tomotherapy alone.

Edmond Sterpin joined the subcommittee. His expertise is dose calculation and treatment planning.

In 2012 the subcommittee came together 4 times. Documents produced by the committee are managed centrally by means of a Google docs account and edited via a 'peer review' method by the committee members.

The subcommittee is in the process of writing draft chapters and reviewing the results. In 2013 the subsequent chapters will be put together to form a draft report.

Members of this NCS subcommittee:

- Vincent Althof (RISO, Deventer, chairman)
- Bie De Ost (UZA/ZNA, Antwerp, secretary)
- Nick Reynaert (Centre Oscar Lambret, Lille)
- Koen Tournel (UZ, Brussels)
- Stefaan Vynckier (UCL, Brussels, representative from the NCS-board)
- Edmond Sterpin (UCL, Brussels)

#### *4. Subcommittee on IMRT Quality Assurance*

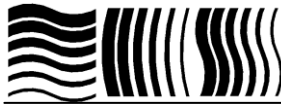
The last decade, IMRT has evolved into a standard treatment modality within the Dutch and Belgian radiotherapy communities. So far, most institutes have implemented IMRT, static or dynamic, for one or more tumor sites with varying degrees of complexity. This NCS subcommittee focuses on the quality assurance required to introduce and maintain IMRT in clinical practice including the following topics:

- Introduction
- Linac commissioning, acceptance and QA
- Treatment planning
- Patient specific QA
- Risk analysis

The committee aims at a comprehensive set of tests, including frequency and tolerances, and practical guidelines or references to relevant literature. These guidelines should serve as a guide to good-practice, not as an exhaustive overview of all adequate procedures. They should provide a practical strategy to setup a QA framework for IMRT. Further, these recommendations can be used to benchmark in-house QA protocols.

The subcommittee has had five meetings in 2012. Progress has been reported at the 6<sup>th</sup> NCS Lustrum symposium.

In 2012 a first draft version of the report was finished. Arrangements have been made to have the report reviewed. Dates have been set in 2013 to produce a complete draft for review. The final version of the report is planned for May. So far, several presentations have been scheduled at the InHolland IMRT-course and the RKF symposium in Maastricht.



Members of this NCS subcommittee:

- Edwin van der Wal (RCWest, the Hague, chairman)
- Jan Wiersma (AMC, Amsterdam, secretary)
- Alle Henk Ausma (RIF, Leeuwarden)
- Luc Bos (MCA, Alkmaar)
- Johan Cuijpers (VUMC, Amsterdam)
- Lars Murrer (Maastrro, Maastricht)
- Geert Pittomvils (UZ, Gent)
- Milan Tomsej (CHU, Charleroi)
- Jeroen van de Kamer (NKI, Amsterdam, representative from the NCS board)

#### *5. Subcommittee on Quality Assurance of Cone-beam CT*

Cone-beam CT scanners integrated with linear accelerators have become increasingly important tools for image guidance of radiotherapy treatments. The application of cone-beam CT based image guidance is very diverse, ranging from bony anatomy based offline correction protocols to online stereotactic tumor based correction strategies. Although most institutions have presently implemented QA procedures for CBCT, the frequency and methods vary widely.

The aim of the subcommittee is to develop uniform guidelines for the commissioning and quality assurance of cone-beam CT scanners that are integrated with a linear accelerator. The guidelines will be based on current literature as well as clinical experience from the participating members of this subcommittee.

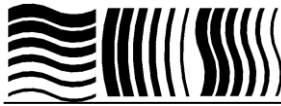
February 2012, the first meeting of the committee was held at the NKI in Amsterdam. During this meeting the scope of the subcommittee was defined; the report will be limited to the quality assurance of x-ray based image guidance systems on conventional linacs, i.e. cone-beam CT (XVI, OBI), and portal imagers.

During the two subsequent meetings (June and November), six subtopics were defined, each of which will form a chapter in the NCS report:

- Geometry
- Dosimetry,
- Image quality,
- Patient safety,
- 4D scanning,
- Software.

Each topic will be handled by three committee members, where one of these has been appointed as the main responsible.

Currently, a literature study, and a survey of current clinical practice in the participating institutes have been performed for all topics. Furthermore, drafts have been made for the dosimetry and image quality sections of the report.



Members of this NCS subcommittee:

Peter Remeijer (NKI/AVL, Amsterdam, chairman)  
Martijn Eenink (RCWEST/LUMC, Leiden, secretary)  
Willy de Kruijf (BVI, Tilburg)  
Kirsten Deurloo (MCA, Alkmaar)  
Niek van Wieringen (AMC, Amsterdam)  
Heleen van Herpt (UMCG, Groningen)  
Marianna Sijtsema (UMCG, Groningen)  
Martijn Hol (Erasmus MC, Rotterdam)  
Martijn Kusters (UMC St. Radboud, Nijmegen)  
Koos Geleijns (LUMC, Leiden, advisor CT dosimetry)  
Joep Hermans (MAASTRO, Maastricht, representative from the NCS board)

#### *6. Subcommittee on QA for Rotational IMRT*

The aim of our subcommittee is to produce a report with guidelines for introduction and maintenance of safe and high quality rotational IMRT (or VMAT) techniques in clinical practice. The report will be based on the experience present in Belgian and Dutch institutes as well as on available literature.

In 2012, we have organized four subcommittee meetings. The core of our report will consist of three chapters: “machine QA”, “plan QA” and “TPS issues”. Each of these chapters was assigned to two or three members. Besides the meetings, the authors of a certain chapter have come together to work on their chapter. Several times one of our members has visited the meetings of the NCS subcommittee on IMRT QA.

Currently, the chapter on machine QA and TPS issues are reaching maturity, and there is a draft of the plan QA chapter. Our aim is to finish the report in 2014.

The subcommittee was strengthened in 2012 with a new member: Lia Vugts, to bring in extra knowledge on Varian equipment.

In 2012, no results were disseminated in the form of publications or contributions to symposia.

Members of this NCS subcommittee:

Anton Mans (NKI, Amsterdam, chairman)  
Mark Arends (RIF, Leeuwarden, secretary)  
Jochem Wolthaus (UMCU, Utrecht)  
Marjan Admiraal (VUMC, Amsterdam)  
Danny Schuring (CZE, Eindhoven)  
Rob Louwe (UMCN, Nijmegen)  
Heidi Lotz (UMCG, Groningen)  
Lia Vugts (BVI, Tilburg)  
Jeroen van de Kamer (NKI, Amsterdam, representative from the NCS board)





## Advisory platforms

The Netherlands Commission on Radiation Dosimetry covers a wide range of expertise through the participating scientific societies. In 1999 NCS platforms were established on dosimetry for radiology and nuclear medicine and dosimetry for radiotherapy. The tasks of these platforms are to give advice on specific research projects initiated by the Government. In case of future needs the NCS can be approached for consultation through its secretary under the condition of modest coverage of NCS experts in terms of attendance fee and travel costs for meetings.

### 1. *Advisory platform on Radiation Protection in Hospitals*

The goals of the platform are:

- Giving advice to both government and the hospital community regarding the radiation legislation and regulation within the sphere of competence of the NCS.
- Coaching and initiating the making and implementation of practical guidelines for the compliance and implication of existing and new Radiation Safety regulations in the spheres of interest of the NCS. The platform operates from within the hospital community for the hospital community for the irradiating professions, working in university hospital, large community hospitals and/or independent institutes.

Activities:

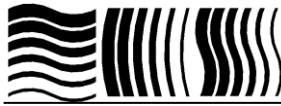
The platform has gathered twice in Utrecht at the office of the NVMBR (meeting room kindly provided by the NVMBR), on March 7<sup>th</sup> 2012 and September 19<sup>th</sup> 2012.

Representatives of the platform attended the following meetings:

- May 29<sup>th</sup> 2012, Consultation of government authorities (SZW) concerning dosimetry policy using lead aprons in radiological procedures;
- July 11<sup>th</sup> 2012, Presentation of NCS report 21 “Diagnostische referentieniveaus in Nederland” to representatives of the Ministry of Health, Welfare and Sport (VWS);
- October 5<sup>th</sup>, 2012, Sixth NCS Lustrum Symposium, Leiden.

Achievements/progress

- Risk analysis:
  - Guideline on risk analysis in nuclear medicine is updated and published;
  - Guideline on risk analysis in radiology has been completed in concept and published for comment;
  - Guideline on risk analysis in radiotherapy is still in development;
- Diagnostic reference levels (DRLs): the final report (NCS report 21) has been completed and published;
- Guideline on the classification of C-worker: the guideline has been completed and published;
- Specific hospital waste: no progress has been made on this topic, project is temporarily put on hold;



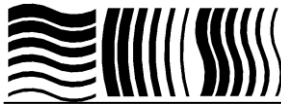
- Lead aprons: the subcommittee completed her work; the guideline on the quality and use of lead-containing and lead-free aprons in radiological procedures is in preparation;
- Other projects and topics that are in preparation or under discussion:
  - Guidelines on protection of the gonads of the patient in radiological procedures;
  - Equivalent lens dose of the worker in interventional radiological procedures (cardiology, radiology, neurointerventions);
  - Ventilation and pressure regimes in laboratories in relation to the revision of the “Bijlage radionucliden-laboratorium” in conjunction with the NVS-GV, a working group of the “Nederlandse Vereniging voor Stralingshygiëne”.

Publications:

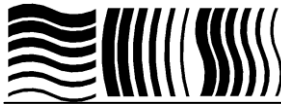
- Guideline “Aanbevelingen risicoanalyse en -evaluatie voor Nucleair Geneeskundige verrichtingen in ziekenhuizen RIAS-NG”, January 2012;
- Guideline “Aanbevelingen risico-inventarisatie en –analyse van de stralingshygiëne voor radiologische verrichtingen in ziekenhuizen RIAS-RAD, Derde definitieve CONCEPT”, January 2012;
- NCS report 21, Diagnostische referentieniveaus in Nederland, June 2012;
- Guideline “Leidraad indeling in categorie C van werknemers die bronnen bedienen in de gezondheidszorg”, December 11th 2012.

Platform members:

Kees Visscher (Chair, NVRO)  
Paul Jonkergouw (Secretary, NVS)  
Roel Claessens (NVNG)  
Koos Geleijns (NVvR)  
Marja Harbers (NVKFM)  
Jeroen van de Kamer (NCS, NVRO)  
Aart van der Molen (NVvR)  
Bradley Pieters (NVRO)  
Lieke Poot (NVNG); membership has ended in December 2012  
Kirsten Schimmel (NVZA)  
Christiaan van Swol (NVKF); membership has ended in December 2012  
Dirk Zweers (NVMBR)

**Financial overview****NCS FINANCIAL OVERVIEW 2012**

	<i>Income (€)</i>	<i>Costs (€)</i>
Savings-account on January 1, 2012	35545.34	
Current-account on January 1, 2012	5275.20	
Project-account on January 1, 2012	-7.17	
	<hr/>	
Contribution Netherlands Society for Radiology (NVvR) 2012	600.00	
Contribution Netherlands Society for Medical Physics (NVKF) 2012	400.00	
Contribution Netherlands Society for Radiotherapy and Oncology (NVRO) 2012	800.00	
Contribution Netherlands Society for Nuclear Medicine (NVNG) 2012	200.00	
Contribution Netherlands Society for Radiological Protection (NVS) 2012	400.00	
Contribution Netherlands Radiobiological Society (NVRB) 2012	100.00	
Contribution Dutch society of Medical Physics Engineers (NVKFM) 2012	100.00	
Contribution Netherlands Society for Medical Imaging (NVMBR) 2012	300.00	
Contribution Belgian Hospital Physicists Association (BHPA) 2012	200.00	
Income 6th lustrum, 5 October 2012	6886.96	
Interest savings-account	794.62	
Interest current account	0.00	
Interest project account		10.58
Cost NCS/NVKFM audits based on NCS18		96.52
Costs Chamber of Commerce		24.08
Banking costs		87.23
Costs web site		167.14
Costs meetings NCS board		564.00



Costs NCS subcommittees		35.70
Costs 6th lustrum, 5 October 2012		3669.91
Savings-account on December 31, 2012		36339.96
Current-account on December 31, 2012		10617.58
Project account on December 31, 2012		-17.75
Total	51594.95	51594.95

**NCS BUDGET 2013**

	<i>Income (€)</i>	<i>Costs (€)</i>
Contributions scientific societies	3100.00	
Interest savings-account	800.00	
Costs Chamber of Commerce		40.00
Banking costs		150.00
Costs of board and subcommittees meetings		1000.00
Costs new web site		3500.00
Total	3900.00	4690.00