Radiotherapy and Oncology xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

NHL-ChirEx: An interprofessional cross-border education initiative in the Greater Region with a focus on radiation morbidity and patient safety

Guillaume Vogin [a,b,c,*], Jochen Fleckenstein [d,e], Jean-Christophe Servotte [f], Philippe Nickers [g], Anne Ebersberger [h], Farid Mohammad [d], Isabelle Bragard [f], Philippe Coucke [f,i], Michel Untereiner [g], Didier Peiffert [a,c], Marc Braun [c], on behalf of Greater Region radiation oncology consortium

[a] *Département de radiothérapie, Institut de Cancérologie de Lorraine;* [b] *UMR 7365 CNRS-UL, IMoPA, Vandoeuvre-les-Nancy;* [c] *Université de Lorraine, Nancy, France;* [d] *Klinik für Strahlentherapie und Radioonkologie, Universitätsklinikum des Saarlandes, Homburg/Sarr;* [e] *Universität des Saarlandes, Saarbrücken, Germany;* [f] *Département des Sciences de la Santé publique Nutrition, Environnement et Santé, Université de Liège, Belgium;* [g] *Centre National de Radiothérapie du Grand-Duché de Luxembourg, Esch s/ Alzette, Luxembourg;* [h] *Klinik für Radioonkologie und Strahlentherapie, Universitätsmedizin der Johannes Gutenberg-Universität Mainz, Mainz, Germany; and* [i] *Service De Radiothérapie, Centre Hospitalier Universitaire de Liège, Belgium*

ARTICLE INFO

Article history:
Received 15 June 2018
Accepted 26 June 2018
Available online xxxx

Keywords:
Interprofessional education
Simulation based learning
OAR
Radiation toxicity
Quality

ABSTRACT

NHL-ChirEx is an interprofessional cross-border education project that addresses the potential excess of radiation induced morbidity throughout the radiation planning and treatment process. NHL-ChirEx is supported by ESTRO and the University of the Greater Region and has been recently approved and funded under INTERREG VA Programme.

The GR is Europe's largest cross-border region counting 11.5 million inhabitants from four member states. Each year 84,550 people are newly diagnosed with cancer (2,450; 23,500; 13,000; 33,000 and 12,900 respectively in Luxembourg, Walloon, Lorraine, Rhineland-Palatinate and Saarland) – half of them are treated with radiotherapy (RT) [1–6]. Up to 15% experience toxicity that can lead to sequelae and additional societal costs [7].

The GR members share a common cultural, economic and historical heritage as well as a unique "University of the GR" confederation.

In 2016, the GR Radiotherapy Consortium was founded by five of the leading universities, the associated comprehensive cancer centers and the radiation technologist (RTT) schools of the area. We aim to share research approaches regarding radiation induced morbidity, strengthen the treatment quality and encourage cross-border exchange of students/professionals.

We stated that:

(1) RT follows a unique organizational model in a complex technical environment, within which multiple health professionals interact (Fig. 1).
(2) Respectively about fifteen radiation oncologists, as many medical physicists, 80 RTT/dosimetrists and a few quality managers are trained in the GR each year with limited cross-border exchange. Despite recommended European core curricula, initial training between the partners is highly heterogeneous (Table 1).
(3) Supplementary and avoidable morbidity could be induced during some critical steps of the RT process. We could propose initial and continuing educational initiatives (Fig. 1) to address this issue. In particular, it has been demonstrated in lung cancer that practical training in tumor contouring on the interface commonly used by trainees allowed to optimize outcome [8]. While harmonization of practices is underway for major tumors, to our knowledge there is no similar project dedicated to organs at risk (OAR).

Abbreviations: GR, Greater Region; HVL, Hôpital Virtuel de Lorraine; IPE, interprofessional education; OAR, organ(s) at risk; RTT, radiation technologists.

* Corresponding author at: Department of Radiation Oncology, Institut de Cancérologie de Lorraine, 6 avenue de bourgogne – CS 30519, 54519 Vandoeuvre-les-Nancy Cedex, France.

E-mail address: g.vogin@nancy.unicancer.fr (G. Vogin).

https://doi.org/10.1016/j.radonc.2018.06.031
0167-8140/

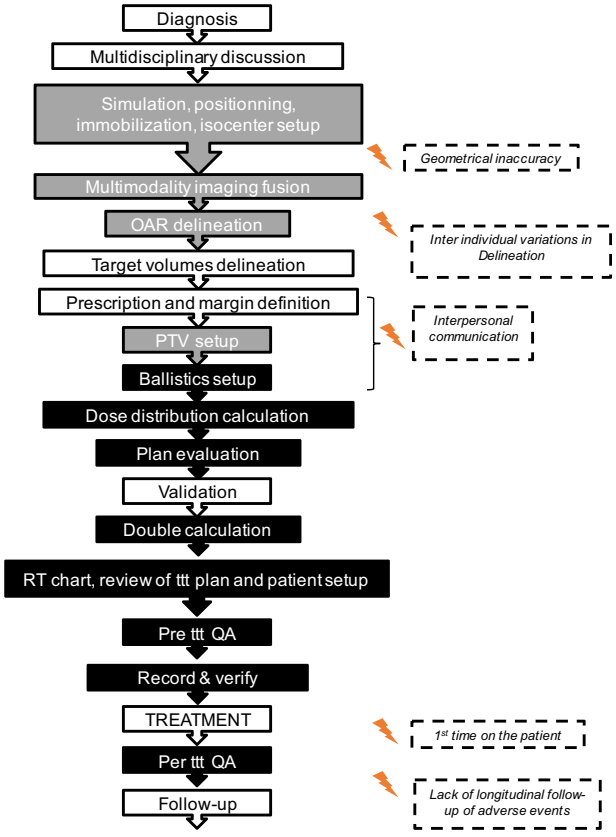

Fig. 1. The RT planning process (left column) and IPE actions addressing weak links (right column).

Interprofessional Education (IPE) initiatives within the field of RT are lacking [9].

Consequently, and in collaboration with the departments of Surgery and Emergency Medicine of the GR academic hospitals, our consortium applied to the INTERREG VA program relying on educational innovations in health and each partner's research areas. Examples include simulation learning in Liège [10,11], research in functional imaging in Homburg [12], the EU-awarded excellence simulation center "Hôpital Virtuel de Lorraine" (HVL) in Nancy [13,14] and the culture of radiation vigilance in Luxembourg.

NHL-ChirEx has been supported by ESTRO and the University of the GR, and awarded a total of 4.5 million euros (Grant N°043-1-01-125).

We have therefore elaborated a 5-axes IPE program. The training will be displayed in 3 languages (French, English, German):

(1) Conceptualization of the training program; definition of the IPE training catalog.
(2) Simulation-based learning: 3D radioanatomy, basics of radiophysics and instruments, RT concepts and techniques, positioning/immobilization and image acquisition procedures, introduction of simulated errors and impact on the patient and the trainee's behavior, comparison of ballistics, quality assurance, maintenance of skills; improvement of interprofessional communication. Two virtual linacs will enrich the offer of the HVL.
(3) E-learning in radioanatomy and practical training in OAR contouring on a web platform accessible from the local planning system.
(4) Definition of functional OARs and adapted planning.

Table 1
Comparative view of the RT professionals' curricula of the GR countries; ECTS: *European Credit Transfer and Accumulation System.*

	France	Belgium	Luxembourg	Germany	Europe/International
Manipulateur/technologue en imagerie médicale/Assistant technique médical en radiologie/Medizinisch-technische Radiologieassistent/Radiotherapy Technologists (RTT)					
Comprehensive training	State diploma or higher technician degree. Bachelor degree (3 years) Décret n° 2016–21 du 14 janvier 2016 Repository of training and skills Theoretical training: 2100 h +Practical training: 2100 h; 180 ECTS Regulated profession (articles L.4351-1, R. 4351-1 et suivants du Code de la santé publique); arrêté modifié du 14 juin 2012 relatif au diplôme d'Etat de manipulateur d'électroradiologie médicale	Nurse bachelor degree (3 years) arrêté Royal 5 avril 1991. Theoretical and practical training 3100 h 180 ECTS No specific 'RTT' training From 2016: 4 years training , Décret du 7 novembre 2013 Theorical and practical training 4600 h; 240 ECTS	Higher technician degree (3 years) 4080 h; 180 ECTS Theoretical training: 2200 h + practical training 1880 h (LTPS.lu)	Theoretical training: 2800 h + practical training: 1600 h (MTA Gesetz 2 aout 1996 & Ausbildungs- und Prüfungsverordnung)	(1, 2)
Specific training in (radio) anatomy	UE2: lectures (95 h), tutorials (45 + 64 h), 8 ECTS + training on site	Anatomy 65 h Imaging techniques 40 h		Anatomy 80 h, Radioanatomy module in the radiology unit: 600 h	/
Radiothérapeute/radiooncolog/radiation oncologist					
Comprehensive training	5 years after medical school graduation + ≥2 years fellowship Theoretical training: 300 h (regional level) +internships 10 semesters (radiation oncology: 4, medical oncology: 2, free: 4). Regulated profession (code de santé publique)	5 years after medical school graduation One exam/year + final exam during 4th year of residency; inter university course + electronic log-book	No training in Luxembourg European curriculum validated by Luxembourg Health Ministry	5 years after medical school graduation; curriculum depending on the resident's region. Final exam after requirements of logbook are met	(2–4)

Please cite this article in press as: Vogin G et al. NHL-ChirEx: An interprofessional cross-border education initiative in the Greater Region with a focus on radiation morbidity and patient safety. Radiother Oncol (2018), https://doi.org/10.1016/j.radonc.2018.06.031

Table 1 (*continued*)

	France	Belgium	Luxembourg	Germany	Europe/International
Specific training in (radio)anatomy	None after medical graduation; optional university degree in radioanatomy	No formal curriculum	None	No formal curriculum; Recommended – but not mandatory – participation in training courses focusing on imaging modalities and radioanatomy	Learning outcome 1
Physicien/physiker/physicist					
Comprehensive training	Diplôme de qualification en physique radiologique et médicale (DQPRM) and/or Ph.D. in physics (arrêté PSRPM du 06/12/201). Theoretical training: 20 weeks + 2 years' full-time internship in hospital Regulated profession (arrêté du 19 novembre 2004 complété par l'arrêté du 6 décembre 2011)	Master in medical physics after the basic physics training: 12 months (including 3 months of internship in radiation oncology). Regulated by the federal agency of nuclear control, and the 'Arrêté Royal du 20 Juillet 2001'	No training in Luxembourg	Successful completion of a Bachelor or Master degree in a scientific or engineering field (e.g. medical physics, physics, biophysics, biomedical engineering, engineering, chemistry). 24 months practical experience in radiation oncology including a six months period with a curriculum to obtain certified expert knowledge Radiation protection courses (24 h + 40 h) Technical discussion after completion of the practical training for candidates without a Master degree in Medical Physics	(2, 5) EU directive 2013/59
Specific training in (radio)anatomy	Theoretical training: 15 h30 (UE 1.1): Clinical and diagnostic basis	Anatomy: 15 h	/	Anatomy/Physiology: approx. 30 h in certified Medical Physics programs	Fundamentals of human anatomy and physiology (2 ECTS) Principles of medical imaging and image handling (15 ECTS)
Dosimétriste/ medical dosimetrist					
Comprehensive training	Currently professional licenses on 3 sites + validation of professional experience. A national reform is underway. Repositories of activities and skills are completed and the training manual is being developed.	/	No training in Luxembourg	/	/
Specific training in (radio) anatomy	1st item of the skills repository "Analyzing the information and process the data required for treatment planning"	/	/	/	/
Qualiticien/quality manager					
Comprehensive training	Various trainings: -specific degree + on-site training (Master 1 or 2) -Physicist or health professionals trained by external organizations unregulated profession	Various health professionals (biomedical, psychology,...) trained by external organizations unregulated profession	/	/	/

1. Coffey M, Leech M, Poortmans P, Committee ER. Benchmarking Radiation TherapisT (RTT) education for safe practice: The time is now. Radiother Oncol. 2016;119(1):12–3.
2. Eriksen JG, Beavis AW, Coffey MA, Leer JW, Magrini SM, Benstead K, et al. The updated ESTRO core curricula 2011 for clinicians, medical physicists and RTTs in radiotherapy/radiation oncology. Radiother Oncol. 2012;103(1):103–8.
3. Baumann M, Leer JW, Dahl O, De Neve W, Hunter R, Rampling R, et al. Updated European core curriculum for radiotherapists (radiation oncologists). Recommended curriculum for the specialist training of medical practitioners in radiotherapy (radiation oncology) within Europe. Radiother Oncol. 2004;70(2):107–13.
4. IAEA. IAEA Syllabus for the Education and Training of Radiation Oncologists. In: AGENCY IAE, editor. Vienna2009.
5. Eudaldo T, Huizenga H, Lamm IL, McKenzie A, Milano F, Schlegel W, et al. Guidelines for education and training of medical physicists in radiotherapy. Recommendations from an ESTRO/EFOMP working group. Radiother Oncol. 2004;70(2):125–35.

(5) Core curriculum for quality managers and development of a shared morbidity and mortality register for monitoring radio-induced toxicities in real time.
(6) Mega base of educational and clinical data collected throughout the program to address its impact on the quality of care provided in the GR.

At the end of this pilot program, we would propose a common qualification to enhance the cross-border mobility and employability of RT professionals. Harmonization of RT process will foster the emergence of a multimodal database shared in GR and interprofessional research initiatives.

Conflicts of interest

There is no conflict of interest to report for this article.

Authorship

GV drafted the manuscript and animate the consortium, JF, JCS, PN, AE, FM, IB, PC, DP, MU, MB filled their own survey for their respective country and regularly participated in the discussions; All authors revised the manuscript critically and have approved the final article.

Please cite this article in press as: Vogin G et al. NHL-ChirEx: An interprofessional cross-border education initiative in the Greater Region with a focus on radiation morbidity and patient safety. Radiother Oncol (2018), https://doi.org/10.1016/j.radonc.2018.06.031

Funding

NHL Chir-Ex is founded by EU-Interreg Va Greater Region Programme (Grant N°043-1-01-125).

Acknowledgements

The authors acknowledge all the people involved in the whole project who could not be cited within the authors: Thomas Fuchs-Buder (Nancy), Farès Namour (Nancy), Pascal Boudin-Corvina (Nancy), Karine Feltgen (Nancy), Catherine Strasser (Nancy), Christian Ruebe, MD, PhD (Homburg s/ Saar), Anne-Carole Nieveler, MD (Homburg s/ Saar), Heinz Schmidberger, MD, PhD (Mainz), Michael Noel (Liège), Nicolas Gillain (Liège), Michèle Guillaume (Liège), Alexandre Guysen (Liège), the deans of the participating medical schools (Marc Braun, Vincent D'Orio, Michael Menger) and ESTRO school.

References

[1] Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer 2015;136:E359–86.

[2] Binder-Foucard F, Belot A, Delafosse P, Remontet L, Woronoff A, Bossard N. Estimation nationale de l'incidence et de la mortalité par cancer en France entre 1980 et 201Partie 1 – Tumeurs solides. Saint Maurice: Institut de veille sanitaire; 2013. p. 122.

[3] Cancer Incidence Projections in Belgium, 2015 to 2025. Brussels: Belgian Cancer Registry; 2017.

[4] Hammer G, Golinska B, Schmitt F. Nouveaux cas de cancers au Grand-Duché du Luxembourg. Luxembourg: Laboratoire National de Santé; 201Report No.: ISBN 978-2-919938-15-5.

[5] Krebsregister Saarland gGmbH. 2014 [Available from: http://www.krebsregister.saarland.de/datenbank/datenbank.html.

[6] Krebsregister Rhineland-Palatinate gGmbH. 2012 [Available from: https://www.krebsregister-rlp.de/en/about-us/what-we-do/.

[7] Mohanti BK, Bansal M. Late sequelae of radiotherapy in adults. Supp Care Cancer 2005;13:775–80.

[8] Dewas S, Bibault JE, Blanchard P, Vautravers-Dewas C, Pointreau Y, Denis F, et al. Delineation in thoracic oncology: a prospective study of the effect of training on contour variability and dosimetric consequences. Radiat Oncol (London, England) 2011;6:118.

[9] Winter I, Golden V. A systematic literature review of interprofessional education initiatives in the field of radiation oncology. Int J Radiat Oncol Biol Phys 2017;99:E131.

[10] Bragard I, Guillaume M, Ghuysen A, Servotte JC, Ortiz I, Petre B. A virtual patient to improve doctor-patient communication: reality or fiction ? Rev Med Liege 2018;73:88–93.

[11] Servotte JC, Guillaume M, Boga D, Coucke P. Methodological approach for the implementation of a simulator in augmented reality in a radiation therapy department. Int J Healthc Manag 2017;10:154–9.

[12] Fleckenstein J, Jelden M, Kremp S, Jagoda P, Stroeder J, Khreish F, et al. The impact of diffusion-weighted MRI on the definition of gross tumor volume in radiotherapy of non-small-cell lung cancer. PloS One 2016;11:e0162816.

[13] Varoquier M, Hoffmann CP, Perrenot C, Tran N, Parietti-Winkler C. Construct, face, and content validation on voxel-man(R) simulator for otologic surgical training. Int J Otolaryngol 2017;2017:2707690.

[14] Sessa L, Perrenot C, Xu S, Hubert J, Bresler L, Brunaud L, et al. Face and content validity of Xperience Team Trainer: bed-side assistant training simulator for robotic surgery. Updates Surg 2018;70:113–9.

Please cite this article in press as: Vogin G et al. NHL-ChirEx: An interprofessional cross-border education initiative in the Greater Region with a focus on radiation morbidity and patient safety. Radiother Oncol (2018), https://doi.org/10.1016/j.radonc.2018.06.031