



Clinical
Oncology

The Royal College of Radiologists

**The Royal College of Radiologists
RCR-Cyclotron Trust Visiting Fellowships 2015/16 (Clinical Oncology)**

POST-VISIT REPORT

Date for Return: This report must be completed and emailed to the RCR within months of the end of your visit

Please complete all sections of this form.

1. Name of Visiting Fellow	Dr Ekaterina Gnutzmann	
2. Name of joint Visiting Fellow (if applicable)	Dr Daniel John Saunders	
3. Institution(s) of Visiting Fellow(s)	Nottingham University Hospitals NHS Trust	
4. Name of Host(s)	Kurt Morath, Professor R Lustig	
5. Institution(s) of host(s)	Roberts Proton Therapy Center, Department of Radiation Oncology, Perelman School of Medicine, Hospital of University of Pennsylvania	
6. Expenses claimed	£	
7. Visit Dates (ACTUAL)	a. Start Date 19/9/16	b. End Date 23/9/16
8. 2 nd visit dates (if applicable)	a. Start date	b. End Date
9. Aims of the visit	<ul style="list-style-type: none">• To obtain a better understanding of the benefits and limitations of proton beam therapy compared with conventional photon radiotherapy, in particular image guided radiotherapy (IMRT).• To gain a detailed understanding and experience of proton beam planning and dosimetry for a range for tumours but particularly for paediatric, CNS, sarcomas• To see a direct comparison of photon IMRT plans and proton beam plans and understand the limitations of both and their clinical implementations• To observe and understand the challenges of proton beam therapy delivery, such as organ motion control, image guidance and delivery for paediatrics• To inform the complex risk benefit analysis of proton beam therapy versus photon radiotherapy.• To understand the differences in dosimetry methods and commissioning process in proton beam therapy versus photon radiotherapy	
10. Activities undertaken		

Day1

- Introduction tour around the Roberts Proton Therapy Center and the Department of Radiation Oncology;
- Attending operational meeting; a presentation with an overview of the radiotherapy facilities and current working arrangements;
- Presentation and chat about history of the centres, commissioning process and current developments (Richard L Maughan, Ph.D.).

Day2

- Attending a paediatric triage chart at CHOP (Children's Hospital of Philadelphia);
- Observing treatment of paediatric brain tumour with proton beam therapy, including pre-treatment anaesthetic process and chat with the CHOP nursing and anaesthetic team; learning about logistic and co-ordinate of the whole process
- Observation of pre-treatment CT-Sim and PET-CT imaging, immobilisation techniques; understanding challenges for 4D PET-CT for lung PBT;
- Attending a paediatric chart round during the lunch break: each patient who is about to start radiotherapy (PBT or photons) has their indications and RT plan peer reviewed before starting treatment, even for palliative indications;
- Spending time in treatment planning and learning about development work for adaptive proton beam therapy with Liyong Lin, Ph.D. and his relevant publications;
- Introduction to PB dosimetry with Prof. Christopher Ainsley
- Discussion with Jim McDonough, Ph.D. about proton beam commissioning process, related challenges

Day3

- Attended morning QA on proton beam lines, followed by PB break down;
- Treatment planning for head and neck with dosimetrists; comparing PB plans and VMAT photon plans, understanding limitations of pure PB treatment (uncertainty range, tissue mobility) and reasons for combined treatment;
- Further discussions with a physicists on treatment planning of different sites: H&N, breast, lung, prostate; including pre-treatment verification process;

Day4

- Spend most of the time in treatment planning with physicists, continued discussions started on the previous day, observed planning process;
- PB is still down and therefore, limited staff resources available to support our visit;
- a tour to the cyclotron room with a physicist;

Day5

- PB is back to clinical use;
- Observation of PB treatment on one of the beam lines: a range of sites, including H&N adult, breast, craniospinal paediatric; understanding the capabilities of their image guidance, the patient pathway, positioning and other important aspects of PBT delivery;
- Spending time with a dosimetrist in treatment planning: reviewing the breast plan, which I observed being delivered; discussion about differences between pencil beam scanning and double scattering for PB treatment, in particular for breast;
- Discussing the role of compensators for double scattering PBT and visiting the workshop where they are manufactured
- General discussion with physicists, about the challenges of their role compared to physicists working on linacs

11. Benefits of the visit (short term)	
<ul style="list-style-type: none"> • I have a much better understanding of the practicalities challenges of Proton Beam Therapy in planning, dosimetry, image guidance and delivery. • The use of the same treatment planning system for PBT and photon VMAT makes it easy to combine PB/VMAT plans where needed. It allows for a quick production of back up plans in case of PB break down. The accumulated doses are easily extracted. This is something we hope to implement, with a purchase of a new planning system in 2017, for our tomotherapy system. It is currently a stand along system and producing a backup plan and calculating accumulated doses is not straight forward. • I have a clearer understanding of the potential benefits of PBT compared to photon radiotherapy, particularly such important factors as uncertainty range, the differences between Doubles Scattering and Pencil Beam Scanning, their particular advantages and disadvantages. In addition I was able to learn about situations when it is advantageous to use a combination of Proton Beam Therapy and advanced IMRT Photon Therapy to optimise therapy further. • I had a couple of very fruitful discussions with the physicists at the Roberts Proton Therapy Center, which enhanced my knowledge of PBT, understanding the issues with proton beam in dosimetry and planning, as well as technical and practical challenges the physicists experience. 	
12. Envisaged benefits of the visit (longer term)	
<ul style="list-style-type: none"> • I am spreading my acquired knowledge to my colleagues • I am better informed and able to assist the oncology consultants with the decision to refer patients for PBS, especially when we have the first UK facilities in Manchester. • We arranged a post-visit educational programme for centres in the East Midlands which will better inform clinicians from across the region. 	
13. Please outline any problems you encountered before, during or after your visit	
<ul style="list-style-type: none"> • Penn Medicine requested a fee for our on-site visit which was not envisaged at the time of the original application. We are grateful that the cost of this fee has been met by the generous sponsorship from Nottingham Hospitals Charity. • During the PB down time on Day 3 and Day 4, less staff resources where available to spend time with us 	
14. When do you intend to submit an article for the RCR Newsletter?	
15. Any additional comments	
Thank you very much for providing us with a unique opportunity to visit the Roberts Proton Center in Philadelphia and learn first-hand about proton beam therapy.	
Signed:	Ekaterina Gnutzmann Date: 4/11/2016
Report approved by:	Professional Support and Standards Board
Date	3 rd February 2017

**Please return this form to Miss Ritu Verma, Professional Standards Administrator at:
ritu_verma@rcr.ac.uk**