



Clinical
Oncology

The Royal College of Radiologists

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RCR-Cyclotron Trust Visiting Fellowships 2016/17 (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	Suliana Teoh	
2. Name of joint Visiting Fellow (if applicable)	Paul Clarke	
3. Institution(s) of Visiting Fellow(s)	Oxford University Hospitals NHS Foundation Trust	
4. Name of Host(s)	Prof Tony Lomax	
5. Institution(s) of host(s)	PSI, Switzerland	
6. Expenses claimed	£ 545.12	
7. Visit Dates (ACTUAL)	a. Start Date 8 Jan 2018	b. End Date 12 Jan 2018
8. 2nd visit dates (if applicable)	a. Start date	b. End Date
9. Aims of the visit	<ul style="list-style-type: none">• To understand the current indications and patient selection criteria for proton beam therapy (PBT)• To gain first-hand experience in the planning and delivery of pencil beam scanning (PBS) proton therapy• To gain insight into the current technique used for delivering PBS in lung cancer• Understand the current challenges in the use of proton therapy in the treatment of thoracic tumours such as motion management, tissue heterogeneity and how some of these issues are tackled• To identify new areas for research in the use of PBT in moving tumours• To develop contacts for future collaborations	

10. Activities undertaken

PSI is the pioneering centre for delivering proton PBS technology. This visit has given me first-hand experience in various aspects related to proton PBS from gantry commissioning, patient selection, treatment planning, plan verification through to treatment delivery and follow-up. There were plenty of discussions and stimulating exchange of ideas throughout the visit with the whole team of clinicians, dosimetrists and medical physicists.

On the first day we were at PSI, the beam line was switched off due to their annual shut down. This gave us a good opportunity to not only view the gantries close-up, but also to examine the beam lines.

Observed:

- Tumour board meeting where discussion of clinical referrals and patient selection took place
- Gantry 3 commissioning (Varian Gantry)
 - o verification of radiation leakage from treatment head using films
 - o evaluation of their new Varian couch for Gantry 3
- Treatment planning:
 - o mould room procedures: how a bite block (immobilisation device) and mask for eye treatment were made
 - o planning process for eye treatment
 - o physician delineation meeting: peer-review of target volumes, dose constraints use in PSI
 - o different methods for delivering PBS: single-field uniform and single-field optimised proton planning for cranio-spinal irradiation (CSI) and head and neck plans with in-house treatment planning system (TPS)
- Machine-specific quality assurance (QA)
- Patient-specific QA:
 - o Air-gap measurements
 - o Plan verification – methods to compensate for the analytical dose algorithm inaccuracies
- Treatment delivery:
 - o patient positioning for cranial, extra-cranial and eye treatments
 - o use of imaging for setup: in-room CT on-rails and orthogonal KV imaging.
 - o preparation of paediatric patients for treatment under general anaesthetic
- Physician long-term toxicity meeting: review of clinical notes, imaging and patient feedback and grading various toxicities based on CTCAE criteria.

Tutorials:

- treatment planning for pencil-beam scanning
- treatment planning for fixed beam line using passive scatter for treatment of the eye

One-to-one discussions with:

- Prof Lomax on PBT in moving tumours, interplay mitigation, Monte Carlo dose calculation algorithm and clinical trials in PBT.
- Dr Marc Walser, lead radiation oncologist, on barriers to widening indication lists, cost-effectiveness of PBT and fall-back planning.
- Dr Jan Hrbacek, lead clinical medical physicist, on implementation of 4D treatment.

Presented my DPhil project on comparison of robustness of intensity modulated proton beam therapy plan versus volumetric modulated arc therapy in lung cancer to the PSI team.

I was even given the opportunity to operate PSI Gantry 1!

11. Benefits of the visit (short term)

We learnt about the capabilities of PSI gantries 1, 2 and OPTIS (fixed beam line) and the various in-house solutions PSI has developed such as patient immobilisation using the bite-block, PSIPLAN TPS, accuracy of their treatment couches, etc.

PSI has very recently started treating moving tumours. We had the opportunity to witness treatment of the first patient with non-small cell lung cancer. The 'one-on-one' session with Dr Jan Hrbacek gave me insight into how PSI implements 4D treatment and discussed challenges associated with treatment of moving targets such as:

- PSI method for 4D dose calculation to assess plan robustness
- use of volumetric rescanning to reduce plan sensitivity due to the interplay effect
- application of deformable image registration and issues surrounding its use
- post-treatment dose verification using machine log files
- limitations of the analytical dose calculation algorithm

The opportunity to present my work enabled me to gain valuable exposure in presenting and defending my work as well as gaining independent critique and feedback from experts within the field.

The discussions I had with the team at PSI have consolidated my understanding in the methods used for planning and delivering PBS plans at PSI. I recognised that not all of these solutions could be readily implemented in other proton centres. This trip has highlighted the advantages but also the limitations of current technology and need for further research to improve proton PBS delivery in moving tumours.

12. Envisaged benefits of the visit (longer term)

The trip has been very useful in formalising my research ideas for my DPhil in use of proton beam therapy in lung cancer. It has allowed me to develop contacts with clinicians as well as physicists for future research collaborations and generate new research ideas which would hopefully be clinically meaningful.

13. Please outline any problems you encountered before, during or after your visit

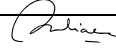
For anyone going on a visit to PSI, it is worth noting that, there is no ATM on site and the cafeterias in the facility will only take cash in Swiss Francs or Euros. Food and drinks are generally a lot more expensive in Switzerland than the UK. Fortunately, the Guest House at PSI is a self-catering facility.

14. When do you intend to submit an article for the RCR Newsletter?

2018

15. Any additional comments

Dr Martin Grossman, our visit co-ordinator, was very helpful in putting together a full agenda and ensuring that the PSI team were aware of us. The whole team was very welcoming and accommodating.

Signed: 

Date: 15 Jan 2018

Report approved by:

Date

Please return this form to Mr David Christopher, Professional Manager:

david_christopher@rcr.ac.uk