



**The Royal College of Radiologists  
RCR-Cyclotron Trust Visiting Fellowships 2014/15 (Clinical Oncology)**

**POST-VISIT REPORT**

**Date for Return: This report must be completed and emailed to the RCR within 2 months of the end of your visit**

Please complete all sections of this form.


<b>1. Name of Visiting Fellow</b>	<b>Dr Anna Thompson</b>	
<b>2. Name of joint Visiting Fellow (if applicable)</b>		
<b>3. Institution(s) of Visiting Fellow(s)</b>	<b>North Middlesex University Trust, London</b>	
<b>4. Name of Host(s)</b>	<b>Dr Jason Efstathiou and Dr Annie Chan</b>	
<b>5. Institution(s) of host(s)</b>	<b>Massachusetts General Hospital, Boston, USA</b>	
<b>6. Expenses claimed</b>	<b>£2,000</b>	
<b>7. Visit Dates (ACTUAL)</b>	<b>a. Start Date 27/4/15</b>	<b>b. End Date 8/5/15</b>
<b>8. 2<sup>nd</sup> visit dates (if applicable)</b>	<b>a. Start date</b>	<b>b. End Date</b>
<b>9. Aims of the visit</b>		
<p>I visited MGH as it has a long history of proton therapy beginning with the Harvard Cyclotron in the 1960's to the current Francis H. Burr Proton centre at MGH.</p> <p>My aims were to develop my knowledge of proton therapy in particular its use in H&amp;N and Urological cancers. I focussed on patient selection and suitability with the aim of understanding the benefits and limitations of proton treatment over IMRT/Rapid Arc plus the acute and late toxicities as this may be relevant to my practice when the UK proton centres open in 2018.</p>		
<b>10. Activities undertaken</b>		

My hosts were Dr Efstathiou Attending GU Radiation Oncologist and Dr Annie Chan Attending H&N Radiation Oncologist. They kindly helped me arrange a full schedule of clinics, meetings and tutorials as follows. I have included examples of cases discussed.

- Head and neck: attended multidisciplinary clinic, on treatment review clinic and tumour board (MDT). I spent time with Dr Annie Chan and Dr John Busse both H&N Radiation Oncologists. We discussed cases and reviewed H&N proton plans together. The patients that appear to benefit most from protons are the Sino nasal tumours or those that invade the base of skull where tumour is close to or abuts critical neurological structures. At MGH they use Protons to treat tumour CTV to 60Gy with a further 12Gy boost to GTV while sparing critical structures. However, GTV coverage is still often compromised and there is often no margin for set up error. As with photons dose calculations may not be reliable at the bone/air interface and any fluid changes in the sinuses can change a plan necessitating re-planning during treatment. This has obvious resource implications. Skin reactions were noticeably worse with protons possibly due to high skin dose +/- uncertainties around the radiobiological equivalence (RBE) of protons. This was evident in the inner canthus especially where ulceration may occur.
- Urology: attended GU multi-disciplinary clinic and on treatment review clinics with Dr Efstathiou and Dr Zeitman. This included discussion of the ongoing Phase 3 trial of IMRT vs. Protons for prostate cancer and observed toxicity of treatments including protons. Note skin toxicity greater in patients receiving protons and occasionally rectal ulceration has been seen. At MGH Proton treatment is planned with 2 opposing lateral beams but conformality around the rectum is inferior to IMRT. Some centres have done planning studies using 2 anterior oblique fields but there are concerns about the dose 'ranging out' into rectum and again RBE uncertainties in normal tissues.

In addition I spent time with Dr Norbert Leibsich who has nearly 20 years experience in treating chordomas with protons. We saw an interesting case together of recurrent chordoma 17 years after adjuvant proton therapy involving the base of skull. We discussed pros and cons of re-treatment with the patient and presented the patient at tumour board.

- Attended daily resident teaching on a range of topics.
- Attended weekly Chart Rounds (peer review of all RT plans of patients starting treatment that week).
- Attended weekly Proton Rounds discussing suitability of proton therapy for all new cases including paediatric, lymphoma, CNS (benign and malignant) and H&N. Some cases were controversial and it was interesting to hear the debate between peers.
- Tour of department and lecture on history of protons at MGH from Dr Ethan Cascio physicist.
- Tutorials from physicists regarding the difference between passive scatter and Pencil Beam Scanning (PBS). The need for an aperture to shape the beam and sharpen the field edge and range compensator (Lucite block) with passive scatter and the importance of spot size (8mm at MGH). We discussed passive scatter versus Pencil Beam Scanning (spot scanning or IMPT) where a single small beam moves across the target delivering dose at differing energies (intensity modulated). This technique does not require an aperture (if spot size small enough) or range compensator and therefore typically has a quicker delivery time.
- I spent time with the planning dosimetrists seeing how proton therapy is planned. Cases included glioma, cranial spinal irradiation and base of skull tumours. Interestingly planning was fairly quick (1 hour for a glioma case) but the workshop has to custom make all apertures and range compensators for passive scatter. A cranial spinal irradiation requires 3 posterior fields and 2 lateral obliques. Field edges are feathered at the overlap therefore a total of 15 apertures and range compensators are required per patient.
- In summery I was made very welcome and part of the team. I was invited to all meetings and staff were interested in my own experience for example with IORT, organ preservation treatments (bladder, H&N) and Rapid Arc. I also had the opportunity to get a sense of the US Health Care system and appreciate the pros and cons compared to the NHS.

<b>11. Benefits of the visit (short term)</b>	
<p>Greater understanding of the appropriate use of protons including benefits and limitations. In particular the comparison of IMRT vs. proton therapy. I gained experience in patient selection and prioritisation of those who may benefit from protons, an understanding of expected toxicities and the importance of long term follow up. I am therefore better informed to discuss proton treatment with patients in the future.</p> <p>I learned a great deal about the physics and radiobiology of protons and also the many uncertainties such as RBE and the Linear Energy Transfer (LET) of protons.</p> <p>I will cascade this information to my department by doing an oral presentation on my return to work.</p>	
<b>12. Envisaged benefits of the visit (longer term)</b>	
<p>I am looking forward to learning more about the UK Proton Centres now that I understand some of the issues with for example the treatment delivery system, spot size and verification processes.</p> <p>I have made invaluable contacts at MGH and hope to have an opportunity to work with them in the future perhaps through clinical trials.</p>	
<b>13. Please outline any problems you encountered before, during or after your visit</b>	
None	
<b>14. When do you intend to submit an article for the RCR Newsletter?</b>	
2015	
<b>15. Any additional comments</b>	
I would recommend this fellowship and MGH to anyone wishing to gain experience in proton therapy. It has been invaluable and the staff at MGH very welcoming and accommodating.	
Signed:	 Date: 13/5/15
Report approved by:	CO PSSB
Date	14.05.15